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Proceedings of the Thirty-Ninth Annual Meeting of the American Association of Economic Entomologists (*Cont.*)

SECTION OF PLANT QUARANTINE AND INSPECTION

Tuesday Morning, December 28, 1926

The session of the Section of Plant Quarantine and Inspection of the American Association of Economic Entomologists, held in the Logan Hall, University of Pennsylvania, Philadelphia, Pennsylvania, December 28, 1926, convened at nine forty-five o'clock, Mr. C. H. Hadley of Harrisburg, Pennsylvania, presiding.

CHAIRMAN HADLEY: In the absence of Mr. Strong, who is Chairman of this Section, I have been asked to start the ball rolling. One of the first duties is to appoint a Nominating Committee to report later. I therefore, appoint the following: J. E. Graf, Chairman, G. M. Bentley and L. S. McLaine.

The program as outlined calls for the address of the Chairman, Mr. Strong, who is not here; therefore, we will go on to the next number.

THE EFFECT OF THE SUPREME COURT DECISION OF MARCH 1, 1926 IN THE CASE OF THE OREGON-WASHINGTON RAILROAD AND NAVIGATION COMPANY VS. THE STATE OF WASHINGTON, ON THE BASIC QUARANTINE LAWS OF THE VARIOUS STATES

By C. L. MARLATT, *Washington, D. C.*

ABSTRACT

A good many States are considering at this time revision of their basic plant quarantine laws in so far as they affect interstate movement of plants and other articles, to bring them in alignment with the amendment of April 13, 1926, of the Federal Plant Quarantine Act, of August 20, 1912.

Inquiry is frequently made as to the extent of State quarantine action possible under the first proviso of the amendment of April 13. This inquiry is often specific, namely, whether a State may act with reference to some district (State, territory,

etc., or portion thereof) which is not covered by the Federal quarantine as to the *subject*, or whether it may act as to additional restrictions above or beyond those specified in the Federal quarantine.

In answer, attention may be drawn to the fact that the decision of the Supreme Court referred to evidently eliminated from State enactment or enforcement all plant quarantine legislation designed to control or regulate interstate traffic in plants and plant products with respect to dangerous plant diseases or insect infestations. The amendment of April 13 restored to the States this power of interstate control and regulation only to a limited extent, for it will be noted that the power thus restored has reference specifically to the *subject*, that is, the disease or insect, and that such power as to *subject* may be exercised only until the Secretary of Agriculture has made a determination as to the necessity of a quarantine and established such a quarantine with respect to the dangerous plant disease or insect infestation. Therefore, under this amendment, a State may act only as to such disease or insect as is not the *subject* of a Federal quarantine, irrespective of any opinion as to the adequacy of the territory covered in the Federal quarantine or the adequacy of the regulations and restrictions established thereunder with respect to interstate movement of products.

As examples, the Secretary of Agriculture has made the necessary determinations and has established quarantines with respect to the pink bollworm, the Thurberia weevil, the gipsy and brown-tail moths, the white pine blister rust, the black stem rust of wheat, and other subjects; all such subjects are therefore eliminated from any State regulatory action on their account, affecting the interstate movement of plant or plant products or other articles. On the other hand, such subjects as the Mexican cotton boll weevil, the alfalfa weevil, the potato tuber moth, the citrus canker, and the chestnut blight, have not been made the *subject* of Federal quarantines and State regulatory control as to movement into or through the State with reference thereto would seem to be permissible.

With respect to subjects, that is, plant diesases or insect pests, which are covered by Federal quarantines, if any State believes that the protection afforded thereby is inadequate as to either district covered or restrictions, or that the restrictions are too drastic for the purpose intended, application for the desired change, as the Supreme Court has said, "must be obtained through application to the Secretary of Agriculture." In cases of emergency, action can be taken by the Department of Agriculture with great promptness.

If, on the other hand, it were possible for a State to act under the first proviso of the amendment with respect to any *district* not included under the Federal quarantine as to the *subject*, or if it were possible for a State to act as to *additional restrictions* as to interstate movement above or beyond those specified in the Federal quarantine, we would have again a mixture of State and Federal action as to the same *subject*, namely, action more or less in conflict and resulting in a state of confusion even worse than that existing prior to the Supreme Court decision of March 1, 1926.

In giving this opinion, it is not to be inferred that it is necessarily the last word on the subject, but rather what appears to be the plain intention and meaning of the first proviso of the amendment, in view of the Supreme Court's decision of March 1, 1926.

Attention is also called to the circular letter under date of April 26, 1926, sent to State plant quarantine officials, giving the opinion of the Acting Solicitor of this

Department on the question "Whether the decision of the Supreme Court in the case of the Oregon-Washington Railway and Navigation Co. vs. the State of Washington nullified all previous State plant quarantines or portions thereof regulating or controlling interstate traffic."

CHAIRMAN HADLEY: Is there any discussion?

DR. WILMON NEWELL: I would like to ask Dr. Marlatt for information on one point. I think we all clearly understand the effect of the Supreme Court decision upon state laws passed subsequent to March of 1912, in so far as those state laws undertook to regulate interstate commerce. What was the effect of that Supreme Court decision upon portions of those same laws which did not have anything to do with interstate commerce? In other words, that portion of the state law relating to interstate commerce was rendered ineffective by the Supreme Court decision. Did that automatically render the entire act of the state ineffective?

DR. MARLATT: I want to preface anything I say in answer to these questions as expressing merely my opinion and judgment, because after all I am not the court of last resort.

If a state has a basic plant quarantine act or law under which it operates both as to internal control of plants on account of pests and also with respect to movement of products into the state, I think it would be a reasonable interpretation that the only illegal part of that statute would be the portion relating to the interstate movement. The Supreme Court decision was very specific all the way through in making its statements apply to interstate movement.

DR. NEWELL: Then as to laws framed after the passage of the National Plant Quarantine Act, the situation would be remedied by amending only that portion which had to do with interstate commerce. Is that correct? And the balance of the act would remain valid despite the fact of its having been passed subsequent to 1912?

DR. MARLATT: That would seem to be a reasonable interpretation.

CHAIRMAN HADLEY: I might say in connection with Mr. Newell's question, that with reference to our Pennsylvania Horticultural Inspection Act, where that same question is involved, we have an informal opinion from our attorney general that only the portion of our act which might relate to interstate movement would be affected. It so happens that apparently our act when originally drawn was passed on recognition of the fact that an interstate package became subject to state jurisdiction only when it was finally delivered at the point of destination, so that our act apparently starts in at that point, and

according to our informal opinion so far, will require no changes, but that is not as yet definite. We are still working on it.

MR. S. B. FRACKER: Dr. Marlatt's reference to the Florida Narcissus quarantine affects probably all the quarantines that will be taken under the third proviso. I would like to ask Dr. Marlatt whether he is willing to suggest a wording for the Florida regulation which would obviate the difficulty that he pointed out. That is, if he is willing to give a general wording that could be adapted to such situations.

DR. MARLATT: I have no wording, Mr. Fracker, that could be definitely incorporated. My thought on the subject is something like this: "That each state, territory, and so forth, should provide by law police powers which would enable the state to cooperate under this proviso, powers which would authorize the seizure, destruction or the removal from the state of articles entered in violation of a Federal quarantine."

I think general language of that type would give any state authority to act with respect to any Federal plant quarantine subject. It does not set forth the idea that the entry in the state of any particular article is prohibited, which might be questioned.

MR. L. R. WARNER: If the state should put through a rule which would give the police power to the state to enforce Federal quarantines and if the state in carrying out those Federal quarantines should have to go into litigation and prosecution, would they do it under Federal court or state courts?

DR. MARLATT: The language of the proviso doesn't say the state shall have power to enforce the Federal quarantine. If they take such action as they see fit under state power, that would be state action enforced from the state police courts.

MR. J. H. MONTGOMERY: Dr. Marlatt referred to a state act of Florida with respect to the Narcissus quarantine. It may be well at this time to make some reference to the circumstances leading up to the action of Florida and why that action was taken. It must be borne in mind that the Narcissus bulb quarantine of Florida was imposed under our present plant act. That is the only act that we can operate under.

In order to prevent the introduction of these various pests, shipments into and within the state were to be made in conformity with the regulation of the Federal Horticultural Board. The thought we had in mind in promulgating that regulation was that it would parallel exactly the provisions of the Federal requirements and would not conflict in any way with the regulations of the Federal Horticultural Board.

The other thought we had in mind was that under this phraseology it would not be necessary for our own state organization to be making frequent changes in its quarantine regulations to conform to any changes which might be made by the Federal Horticultural Board. In other words, this would be a standard regulation and would virtually enforce under state conditions the regulation promulgated by the Federal Horticultural Board. Those are the two thoughts we had in mind. It must be borne in mind that we were operating under a law which was questionable; we have not yet had an opportunity to have that law revised or amended.

MR. GEORGE A. DEAN: A point came up about drafting a change in our laws, giving the state authority, as Dr. Marlatt suggested, to seize any article shipped into the state in violation of the Federal law. If the state did amend its law in such a way that it would have that authority, could the Federal Horticultural Board deputize a state man to seize produce shipped in, in violation of the Federal law.

DR. MARLATT: I am glad Mr. Dean brought up that idea, because it opens up a point which I would like to cover briefly. I will answer "No," in the first place, to his question, because, unfortunately, the Federal authority is limited, and that is the large remaining weakness of the Federal Plant Quarantine Act; we have power to punish, imprison and fine for violation, but we have no power of seizure, of destruction of property or articles that have been shipped in violation of the Federal plant quarantine. That is the great weakness of the Plant Quarantine Act which we have endeavored for some years to get Congress to consider. In fact, we have a motion going now by which we hope to get an amendment which will give us power to seize and destroy or otherwise safeguard anything that is moved in violation of a Federal quarantine. It is just at that point that the states can furnish and do furnish a very valuable aid and this authority to cooperate under this proviso of the amendment to the extent of taking possession of, or safeguarding in any way the police powers of the state may permit, articles which are shipped in violation of the Federal quarantine, is of great value both to the state and to the general enforcement of the Federal quarantine. State police powers can do that. If they haven't such powers, they can get them, but the Federal Government is unable to do any seizing and destroying; hence, they could not deputize, as you suggest, a state officer to do it.

MR. FRACKER: Dr. Marlatt suggested that a general provision of the statutes authorizing the states to pass restrictions on the introduction of plant material into the state would be invalid under an opinion of

the solicitors and that some recognition should be made of the Federal limitation in any such legislation. I would like to suggest to Dr. Marlatt that the solicitor's opinion in that particular be sent out to the inspection officers, because our various bills are being drafted at this time and it is very likely that those who are drafting these bills may unintentionally invalidate their own statutes by having them cover a greater breadth of subject than they should under the solicitor's opinion.

DR. MARLATT: I think that is a very good suggestion. I will say that I have already taken action along that line. I asked the solicitor to take this draft of a model state law, which you may recall was drawn up by Solicitor Morrill of the Department and which was a very good general type law, and revise it on the basis of the Supreme Court decision and of the amendment of the act. He has made a brief attempt at it, but in looking it over I find he has not yet nearly covered the subject. I hope to have something that can be sent out to the states, a specific section relating merely to that phase of it, which is all that would be necessary, because state laws are varied and the states will not want to change them all, but I would like to be able to put in the hands of the several plant quarantine officers of the states at least a suggestive draft of a section.

While I am on my feet I want to simply introduce another subject which is somewhat germane to this discussion, and has relation to state and Federal cooperation in plant quarantine work. You perhaps know our friends on the Pacific Coast have been very urgent for some years to have a sort of an annual conference on plant quarantine matters so that all subjects of interest could be thrashed out and a better understanding had with respect thereto. Recently Mr. Hecke and Mr. Strong of California made their appeal directly to Secretary Jardine on that subject, the thought being that the Secretary should call a conference whenever occasion required of the leading plant quarantine officials, or at least the leading official of each of the forty-eight states and perhaps some of our territorial possessions as well, for discussion of these problems, these men to be brought to Washington at Federal expense. That was the principal idea in Mr. Hecke's mind, because he felt it would be difficult to get the state to appropriate money to permit officers of the state to go long distances. The Secretary was impressed with the idea, and he has authorized us to look into it further and see if some plans can be worked out along that line. The idea is that we may have subjects arise on which a general conference of that kind might be of great value, as it was a few years ago when we had a general

conference similar to what we are discussing today, on the interrelation of state and Federal plant quarantine laws.

This is just thrown out as a piece of information. Something may come of it. In a way it butts into, perhaps, and infringes on the organization which has already been made by the states for group conferences, that is, the regional plant quarantine boards, and it seems to me that if we do anything in that line, we should take these boards into consideration so that we won't be treading on each other's toes and perhaps covering unnecessary ground.

CHAIRMAN HADLEY: The next paper is by Mr. L. S. McLaine.

THE PLANT INSPECTION SERVICE OF CANADA

By L. S. MCLAINE, *Entomological Branch, Ottawa*

ABSTRACT

The first federal pest legislation in Canada was the San Jose Scale Act passed in 1898, this Act was replaced in 1910 by the Destructive Insect and Pest Act. In accordance with the regulations of the latter Act, all plants entering Canada were subject to inspection or fumigation or both. In 1923 these regulations were revised, and importers are now required to secure permits to cover importations. Plants from countries other than the United States may only enter through specified ports and are subject to reinspection. Plants from the United States are not subject to reinspection but must be accompanied by a certificate of inspection and a certificate of fumigation unless exempt from treatment. For the year ending March 31st, 1926, 13,730 permits were issued to 6,354 different consignees. In all 5,555 inspections were made, the number of plants examined was 30,463,699. Pests and diseases were intercepted in 199 different consignments. Plant products were also examined, as well as passengers baggage, etc.

Canada like her neighbor to the south has within the past few years developed a very great interest in horticulture, floriculture and the allied industries. Horticultural societies are rapidly increasing in number each year and due to their efforts many small towns which a few years ago consisted of houses with lawns about them have been transformed into most attractive and artistic communities. The public are being educated as to the value of the use of flowers and shrubs and as a result there is a rapidly increasing demand for bulbs, roots, nursery stock, etc. Canada although covering a large area from the Atlantic to the Pacific has for the most part a short growing season. Many kinds of plants can be propagated economically and profitably at home, but in other cases it has been considered advisable to import them from other lands. Apart from the great increase in the amount of plant material propagated in Canada there has also been an increase in the material imported. In 1900 a total of $88,054.00 worth of plants was imported as compared with $1,109,413.00 worth for the year ending March 31st, 1926.

The first federal insect legislation in Canada was the San Jose Scale Act passed in 1898, which prohibited the importation entirely of trees, shrubs, plants, vines, grafts, cuttings or buds from the United States, Australia, Japan, and the Hawaiian Islands. This act was found to be so detrimental to the development of the horticultural and allied industries that it was modified two years later and the importation of the prohibited plants was permitted from the specified countries, provided they were routed on certain ports and there fumigated with hydrocyanic acid gas. In 1909 there was a serious outbreak of the brown tail moth in France, large imports of fruit stocks were being brought into Canada from Europe and inspection of these showed that many shipments were infested with this pest. There was no legal machinery in force at that time to require the inspection of such shipments, but through the whole hearted sympathy and co-operation of the importers who realized the seriousness of the situation, arrangements were made whereby all such importations were examined at destination. The fact that so many shipments were infested with a pest that was causing such serious damage in the New England states at that time brought about the realization of the danger of importing plants from foreign lands without suitable inspection, especially as it was found that fumigation had no effect on the hibernating brown tail caterpillar. In order to meet this situation the Destructive Insect and Pest Act was prepared and passed by Parliament in 1910. The Act provides for the Governor General in Council to make such regulations as are deemed expedient to prevent the introduction or admission into Canada or spreading therein of any insect pest or disease, destructive to vegetation. Although innumerable regulations have been passed in accordance with its authority, and on all manner of subjects, it has never been necessary to amend the Act itself. After the passing of the Act regulations were soon brought into force which required all importations of nursery stock to enter Canada through specified ports and at certain seasons of the year. Such shipments were subject either to fumigation or inspection, or both. The latter was carried on either at the port or destination.

By 1920 it was understood that insect and pest legislation had assumed such a complicated aspect, and involved so many different problems, not only as regards plants, but also plant products, as well as international trade, that it was considered advisable to constitute an Advisory Board to consider such matters. Early in 1922 the Destructive Insect and Pest Act Advisory Board was formed, and five officials of the

Department of Agriculture were appointed members. The Board is not empowered to pass legislation, but may recommend to the Minister of Agriculture any changes which are considered advisable and in the public interest, and also may call upon others to act in an advisory capacity. The Board itself does not administer the various regulations, but leaves their administration to the particular Branch concerned.

The first duty of the Board was to consider a general revision of the regulations then in force. The revised regulations consisting of a series of General Regulations and fifteen foreign and seven domestic regulations went into effect in September, 1923. The General Regulations consist of fourteen sections and are more or less comprehensive, they empower the Department to inspect or examine any plant or plant product offered for entry into Canada and if found infested with any pest or disease may be refused entry, treated or destroyed. This section is of particular value in the handling of importations not covered by any special regulation or order. Provision is also made for the inspection of export shipments, powers of inspectors, the right of trespass, the disposal of infested material, the importation of plants for scientific purposes, etc.

The foreign and domestic regulations deal with specific problems, they may be increased in numbers, amended or modified as occasion demands. The regulations of possibly the greatest interest are those dealing with the inspection of nursery stock.

Regulation No. 1 (Foreign) deals with the importation of nursery stock from countries other than the United States, and may be summarized as follows: The importer is required to secure a permit to cover his importation. Shipments may enter Canada through one of the following ports, St. John, N. B.; Montreal, Que., Niagara Falls, Ont., or Vancouver: B. C.; containers must be marked with the permit number, names and addresses of the consignee and consignor, quantity and nature of contents contained therein and a copy of the original certificate of inspection. Shipments may not be moved from the port of importation unless a certificate of inspection, or a certificate of clearance which permits the consignment to proceed to destination for inspection, is issued by an officer of this Department. All shipments entering Canada under this regulation are subject to reinspection. The inspection service is under federal control, with the exception of British Columbia where the work is carried on by provincial officers who act as collaborators of the federal service.

In addition to inspectors being stationed at the aforementioned ports of importation, there are a number of inspection districts scattered throughout the Dominion. Plants consigned to individuals situated in these districts, are usually not examined at the port of importation but are permitted to proceed to destination for inspection. In such cases the port inspector advises Ottawa that a certificate of clearance has been issued for the particular consignment and Ottawa in turn, notifies the district inspector concerned as well as the importer. The district inspector keeps in touch with the importer until the shipment has been examined and passed. The Department of Customs do not release shipments unless either one of the required certificates is attached to the shipping papers. If a certificate is missing it means that the shipment has been improperly routed. Small packages of plants may also be imported by mail. Official labels are furnished to the importer on request, these are forwarded by him to the shipper who affixes them to the parcel. Montreal and Vancouver are the mail inspection stations. On arrival at one of the above, the plants are examined and if passed are forwarded in bond to the customs house nearest to the address of the ultimate consignee, without the payment of additional postage.

Regulation No. 2 (Foreign) governs the importation of nursery stock from the United States. Under this regulation the importer is required to secure a permit, but the plants are not subject to reinspection in Canada, with the exception of shipments consigned to residents of the province of British Columbia, which must enter via Vancouver for examination, in accordance with the provincial regulations. This regulation further requires that all shipments of plants must be accompanied by a certificate of inspection and also a certificate of fumigation, unless the plants are exempt from such treatment. Both certificates must be signed by a federal or state official.

At the time this regulation was under consideration, the Board were of the opinion that with the well organized inspection services in the various states, arrangements could be made for the inspection of shipments intended for Canada, at the time of packing. That is, it would be carried out on the same basis as exporting countries are required to inspect before shipment, consignments intended for the United States. Unfortunately the results were not entirely as anticipated, in several states co-operation has been secured, whereas in others the only certificates issued are those in blanket form valid for a year or even longer, and based on the inspection of the nursery at some period during the growing season. In certain cases it has been almost impossible to secure

inspection certificates, covering greenhouse plants. Many of our commercial greenhouse men suffered severe financial loss due to importing plants infested with such pests as the Florida fern caterpillar, rose midge, chrysanthemum midge, leaf tyer, etc.

For the year ending March 31st, 1926, the following statistics with regard to the inspection service are available. A total of 13,730 permits was issued to 6,354 different consignees to cover shipments of plants from all countries. In all 5,555 separate inspections were made, consisting of 30,463,699 plants contained in 22,466 separate packages. In 199 different consignments pests or diseases of one kind or another were intercepted. At the port of Montreal 1,005 mail packages containing 94,082 plants were examined. Several species of plants are prohibited entry for specific pests or diseases; during the year 128 interceptions were made; in 106 cases permits were refused and 22 seizures were made by the inspectors, the plants involved by these interceptions totalled 13,490, which did not include 19 shipments of potatoes.

All passenger boats arriving at ports at which inspectors are stationed are attended at the time of disembarkation; 318 boats were attended at St. John, Quebec, and Montreal last year. Plants were found on 116 of these which were being brought in as baggage by 208 different passengers. Particular attention is paid to the port of Quebec during the season of navigation as this port is where the greater proportion of immigrants disembark.

In addition to plants, inspectors are engaged in the examination of plant products which arrive from all parts of the world; last season 5,692 separate inspections of these products were made, involving 1,049,833 packages, 83 shipments were infested with insect pests.

During recent years there has been a growth in the export trade of plants, etc. Last year 326 inspections of export shipments were made, for consignments going to nineteen different countries. The exports consisted of 283,676 plants; 106,766 bulbs; 4,430 pounds of forest-tree seed, and miscellaneous shipments such as onion sets, tobacco plants, corn stalks, etc.

DR. MARLATT: Mr. Chairman, I want to call attention to one very attractive feature of the Canadian Act—its brevity and comprehensiveness. It is the shortest and most comprehensive and effective act that I know of in the whole history of plant insect pest legislation, and apparently it is adequate.

Some years ago when a request came from half a dozen states to draft for them a state law, and this Association was interested in drafting a state law, I took it up with our solicitors and the result was this state law which I mentioned a moment ago. It is a rather long one, but a good deal shorter than most state laws. I urged the solicitor to get one as short as the Canadian law. I gave him the Canadian law as a model that I wanted him to follow, but I was advised that the United States was different, that we were a different sort of a country, that we had Federal and state powers, and what the Federal Government could do and what the states could do was more or less limited and we couldn't get what we wanted in brief language like that. What they have is a certain named body having authority to do what is necessary—to prevent pests from entering the country or to eradicate them, and that is all that is necessary, but unfortunately we are not able to do likewise.

CHAIRMAN HADLEY: If there is no further discussion, we will go on with the next paper.

ADVANTAGES AND DISADVANTAGES IN THE USE OF PRINTED CERTIFICATE TAGS

By S. B. FRACKER, *Madison, Wisconsin*

ABSTRACT

Printed nursery inspection certificate tags are subject to various kinds of misuse but constitute the only means of insuring growing-season inspection in advance of shipment. Such summer inspection is essential in the case of raspberry plants, white pines, currants and gooseberries, roses, elms, and other nursery stock. It is recommended that the use of printed certificate tags showing growing-season inspection be retained, but that additional safeguards be employed to prevent their misuse.

Since the establishment of nursery and plant inspection in the United States, two methods of attack have been developed in different sections and they have now grown so far apart that they might be said to represent two separate schools of thought among inspectors.

The earlier of these in time of introduction is the one now used almost exclusively in the northern, eastern and central states. This is based on the inspection of plants during the growing season by officers of the state in which they are growing, the issuance of an inspection certificate covering the entire premises, and the attachment of printed copies of this certificate to all bundles, boxes or carload lots of nursery stock shipped by the owner of the premises. This plan is based on the recognition of such certificates by the state of destination and the assumption that the certificate holders use the tags honestly.

The second method of attack consists of the inspection of all plants coming into a state or district, *after* they have arrived at their destination. This was developed in the south and west in the realization that valuable horticultural interests are more adequately protected when reliance is placed on the decision of their own employees as to the presence or absence of insect pests or plant diseases and the relative importance of such pests as are found on the stock. Such a plan involves neither the recognition of the work of other inspectors nor the assumption of honesty and carefulness on the part of the nurseryman and his employees.

In addition to these two methods, a third has been proposed, namely inspection of nursery stock while dormant at the time of shipment, and personal certification of each bundle by the inspector. Prior summer inspection could also be required when it was believed necessary.

The secretary of the section on Horticultural Inspection has asked me to discuss the relative soundness of these different points of view, particularly as the agricultural officers of leading western states are questioning the value of printed certificate tags covering and attached to shipments of nursery stock. Possibly their purpose is to lead up to a proposal that printed certificate tags be entirely discontinued.

Inseparable from the shipping tag problem is the difference in results which may be obtained from a growing-season inspection on the one hand, and dormant-season inspection on the other. If summer inspection is to be maintained it can be enforced only by a requirement that all nursery stock shipped or delivered bear a copy of an inspection certificate. If stock is inspected at destination, on the other hand, no certificate need be issued before shipment.

Taking up, first, the method of inspection at the point of production during the summer season, we find certain advantages and other pronounced weaknesses. In the first place, certain diseases show no symptoms which can be determined on the dormant stock, and growing-season inspection is essential to diagnose them. The Mosaic type of disease is the one which is attracting most attention at the present time. While only three states have published regulations on this subject, the northern and eastern states at least are now assuming that raspberry nursery stock is carefully inspected for Mosaic and that when inspection certificates are attached to it the plants may be assumed to have less than a certain minimum percentage of infection. No types of shipping point inspection or inspection at destination can take the place of certification of the premises when it comes to the shipping of raspberries

in the northern states at the present time. Dormant-season inspection is now wholly unacceptable to all the states with relatively large raspberry producing centers.

A similar situation exists with respect to the white pine blister rust. This disease cannot, ordinarily, be detected on the white pine within less than two or three years after the infection takes place. The presence of the disease in the vicinity, however, can be determined with comparative certainty and ease by an inspection of the currant and gooseberry bushes during the late summer. Preventing the further spread of the blister rust and its establishment in new localities depends almost entirely on the late summer inspection of the premises on which Ribes plants are grown and of the surroundings of pine-producing nurseries.

In many cases also, summer inspection is much more practical and efficient than the dormant season examination of the plants. Examples of insects and diseases more readily determined while the trees and plants are in full leaf are strawberry root lice, maple wilt, elm canker and cranberry falseblossom. Unless a shipment of nursery stock is certified as coming from premises on which these pests and diseases do not occur or are under control, the customer in the state of destination has no way of protecting himself against their establishment, as finding them during the dormant season is uncertain and in some cases impossible.

The weaknesses of the use of printed certificate tags following a summer inspection of the stock are also quite obvious. The first weakness of the plan is the fact that an insect which is either of no consequence or generally prevalent in the state in which the nursery stock is produced, may prove expensive or even disastrous at the point of destination. Certain sections of the west are attempting to keep horticultural districts entirely free from even such pests as the codling moth and such scale insects as might be called mildly injurious. In these cases certificates based on summer inspection are relatively worthless because the inspectors usually give no consideration to the ordinary and slightly injurious insects of their own vicinity. Even if they should attempt to take such insects into consideration, an infestation common in the neighborhood but absent from a nursery might become started in the nursery the week after the inspector left the premises.

Second, as to efficiency of inspection, it is probable that the examination of dormant stock for certain pests, such as San Jose scale and many other scale insects, can be carried on more rapidly and with greater certainty than the inspection of the trees standing in the nursery row in

full leaf. Insects and diseases attacking the roots ordinarily require a packing house inspection regardless of the general policy of the department doing the work. This applies, particularly, to crown gall, nematodes, and woolly aphis. Many kinds of plants should, therefore, receive both active and dormant season inspections.

A third and serious disadvantage comes from the misuse rather than the proper employment of such tags. Incidents will come to the mind of every inspector in which nurserymen have loaned certificate tags to their neighbors who desired to ship a bundle or two of nursery stock, or have placed the tags on stock which the inspectors have never seen, or have continued to use certificate tags after the certificate on which they were based has expired. These are really serious weaknesses and are great enough, in fact, to destroy the value of the tag when a state is in the position of Florida, attempting to protect herself against any possibility of the re-introduction of Citrus canker. A few states, by issuing serially numbered tags, sent from the inspection office, are able to correct this fault to a large extent.

In order to determine just how closely our own nurserymen follow the letter of the Wisconsin law, we recently requested all of them to send samples of their tags to the inspection office. The law follows most of those of the central and eastern states in requiring, that "every person selling or shipping nursery stock shall attach to the outside of each package, box, bale or carload lot so shipped or otherwise delivered, a tag or label on which shall appear an exact copy of his certificate. The use of tags or labels bearing an invalid or altered certificate and the misuse of any valid certificate is prohibited."

At the time of writing, 351 out of 497 certified Wisconsin nurseries have responded to this request.

The results are shown in the following table:

	Number	Per cent.
Tags not yet secured from printer	69	19.7
Owners expect to secure no tags	97	27.5
Tags incorrect or altered	50	14.5
Tags correct	135	38.3
Total replies received	351	100.0

Among the tags which were not exact copies of the certificates held by the owners, the most common fault was the alteration of the printed date on old tags. One of these dated back to 1916, one each to 1917, 1919, 1921, and 1922, four to 1924, five to 1925, and six to 1926. The most serious fault was that 37 of these tags used the old wording which listed "nursery stock" as having been inspected and released for ship-

ment, when only some special kind, such as "strawberry plants" or "ornamentals," was in fact covered by and stated in the original certificate furnished the owner.

Of the ninety-seven who stated that their nursery business was so limited and local that no certificate tags were used, thirty-one said they would have no stock for sale in the spring of 1927, and had asked for inspection for their own information only. This latter group, while of importance from several standpoints, does not include nurserymen who make interstate shipments, and needs no further consideration here.

The item of greatest interest developed by this investigation, therefore, is the fact that 50 of the 185 tags received, were either altered in ink or were not "exact copies" of the inspection certificates as they purported to be. If the printers correctly print the 69 jobs now in their hands, the total proportion for the spring of 1927, would be, unless corrected, 50 incorrect tags to a total of 254, or 20% in error.

These figures decidedly weaken confidence in certificate tags when the nurserymen are allowed to supply them, even tho the 20% are smaller concerns probably shipping less than 1% of the stock on the market, and even tho we have no evidence that uninspected stock was sold or shipped under the altered tags.

Perhaps at this point, Wisconsin nurserymen should be relieved of the burden of unusual carelessness in the handling of certificate tags. We have at the office a small museum of tags from other states at least equally faulty. Even nurserymen are not solely to blame, for bundles of nurserystock arrive uninspected every year from one of the strictest of the Pacific coast states bearing unauthorized permit tags. We picked up this fall a certificate tag from another Pacific coast state, signed by an official inspector, but omitting both the number and name of the shipper and the point of shipment and therefore bearing no clew to his identity! Federal blister rust inspectors pick up expired certificates every year from many states.

In other words, the trouble is with the system of issuing certificates and expecting hundreds of nurserymen to secure correct copies of them. Some are sure to misuse or carelessly abuse the privilege.

If we now examine the method of inspection at destination, we find that this plan also has certain advantages and other disadvantages. Most of these have already been mentioned. The county or state inspector at the point of arrival can open a box of nursery stock and determine with speed and certainty whether or not scale insects are

present, or whether there are bark lesions on the trees indicating such diseases as apple canker and chestnut blight. He can also carry out the policy needed in the particular location in which the trees are to be planted and he is under pressure, political or economic, to protect the customer in every possible way.

In addition to these points, the purchaser knows that the certificate when attached to the box covers the exact stock contained in the box and not something else which the nurseryman found convenient to include.

The weaknesses, as indicated a few moments ago, are, first, that the inspector is unable to determine whether raspberry plants are free from Mosaic diseases, whether white pine may recently have become infected with the white pine blister rust, whether rose midge is present on greenhouse roses, or whether elm canker may be attacking the elms, and he would have difficulty in convincing himself that strawberry root lice and rootworms were absent from the strawberry plants and, possibly, even that maple wilt was not present on the maples.

So far as the northern states are concerned, there are also several administrative difficulties relating both to funds and to personnel, which prevent the adoption of inspection at destination. The cost of maintaining an inspector at every point of destination or even in one locality in a county is much beyond the funds now available. Even if adequate appropriations were secured for this, however, in states without extensive horticultural interests, it would be almost impossible to get competent local men to take over this responsibility during the spring months. The work is so seasonal that a full-time twelve-month crew of adequate size could not be maintained.

An additional weakness is the fact that when inspection is confined to destination only one express agent and only one inspector are responsible, while every transportation company employee en route and several inspectors may be able to check on tags attached before shipment.

When the secretary asked that this paper be prepared he did not indicate that the author should attempt to point a way out of the dilemma. In my own mind, however, I have come to certain conclusions so far as the policy for states in the north central region is concerned. They are as follows:

1. Growing-season inspection is essential in the case of many kinds of plants.
2. It can be enforced only at the source, not at destination.

3. It can be evidenced only by certificate tags attached before the stock is accepted for shipment by the transportation company.

4. States should either furnish such tags or should check on them annually to be sure they are correct.

5. If funds are available and competent personnel can be secured, an additional shipping point inspection is desirable with all tags being furnished and attached by the inspector.

6. When supplementary shipping point inspection is impracticable, more supervision at important distribution points en route is desirable and both the states and the federal department should increase the amount of work of this kind.

7. In some areas inspection at destination offers additional protection.

8. Even when inspection at destination is maintained, many trees and plants (including raspberries, currants, white pines, roses, elms, and maples) should not be accepted unless the bundle bears a tag evidencing prior growing-season inspection.

MR. WARNER: I want to comment on a point that was brought out by the gentleman from Canada. Their parcel post shipments of plants evidently will go to central points of inspection, and after inspection be sent postage free to destination. That isn't the case in the United States. The person who sends a very delicate plant has to also include postage from the central inspection point with which to send it to the destination point, and often the plant dies while you are trying to get the postage to help the person out. Was that right?

MR. MCLAINE: Yes. It applies particularly to plants imported into the country, not shipments of plants that are forwarded from one point of the Dominion to another. It was an arrangement which was made after a good deal of deliberation between the Customs and the Post Office Departments. They finally agreed to do it.

MR. WARNER: It seems to me that is a weakness in our American laws at the present time. If we could arrange with the postal authorities to send them free to destination, there would be more plants inspected. As it is, the postmasters deliver them instead of sending them to inspection points.

MR. MCLAINE: If the shipment of plants arrives at a point other than an inspection point, it has either to be destroyed or go to an inspection point for examination, in which case the consignee has to pay the postage both ways.

MR. E. R. SASSCER: Dr. Fracker, in introducing his subject, remarked that he understood the Western Plant Quarantine Board was going to take certain action at their last meeting with respect to certificates, especially as applied to those packages. Such action was taken, and resolutions were sent to the Board following the meeting. For the benefit of those here, I am going to read the latter part of this resolution.

"Therefore, be it recommended, That the Federal Horticultural Board take up with the Secretary of Agriculture for recommendation to the Post Office Department that paragraph 2 of Section 467 of the Postal Laws and Regulations be so amended as to eliminate the broad certification requirement and make special provision for labeling plant or plant product parcels in order to reveal the exact nature of the contents, their origin, and the name and address of the sender."

For your further information, I am going to read Paragraph 2 of the Postal Regulations:

"Nursery stock, including all field-grown florists' stock, trees, shrubs, vines, cuttings, grafts, scions, buds, fruit pits and other seeds of fruit and ornamental trees or shrubs, and other plant products for propagation except field, vegetable, and flower seeds, bedding plants and other herbaceous plants, bulbs and roots, may be admitted to the mails only when accompanied with a certificate from a state or government inspector to the effect that the nursery or premises from which such nursery stock is shipped has been inspected within a year and found free from injurious insects and plant diseases, and the parcel containing such nursery stock is plainly marked to show the nature of the contents and the name and address of the sender."

The object of bringing this up at this time is to determine whether or not this organization desires to be placed on record on this subject. A brief summary indicates that thirty-three of the states now require certificates on all containers entering the state. There are eleven of the states which require that the containers bear a license tag, all of which would be eliminated if you carried out the suggestion contained in the resolution which I read a moment ago. States requiring certificates of fumigation include seven. There are now fourteen states exercising the right of terminal inspection.

It has occurred to me that perhaps it would be well before attempting to go on record to have a committee appointed to decide whether or not you want to make a similar recommendation.

Naturally in taking this action the Western Plant Quarantine Board had in mind many of these small shipments made by friends in exchange

of plants. We can perhaps safely say that fifty per cent of the postmasters are not aware of this regulation, or have forgotten it and accept plants.

CHAIRMAN HADLEY: Are there further comments?

Is it your thought, Mr. Sasscer, that this body should draw up and pass on certain definite recommendations along that line?

MR. SASSCER: It is not necessarily my thought. The Federal Horticultural Board has been requested by the Western Plant Quarantine Board to take the action referred to in the resolution. It occurred to me that those states represented here would like to consider this resolution from the standpoint of the effect it will have on their state regulations.

I don't believe that you could very well decide this in a few minutes, and it is my suggestion that you have a committee who would have an opportunity to go over the papers I have and report back this afternoon. Naturally the Board would like to have some idea as to the feeling of the states east of the Rockies with respect to this resolution.

MR. FRACKER: As indicated in the paper just read, I feel that such action on the part of the Post Office Department would be very unfortunate. In our state even where inspection at destination is possible, many kinds of stock are not acceptable at the present time. I think it might be desirable for this body, if they wish, to consider that matter further, since the only communication now before the Federal Horticultural Board is the one from the Western Plant Quarantine Board requesting modification of the postal regulations along those lines.

MR. MONTGOMERY: It occurs to me that this matter possibly involves questions that are much more far-reaching than appear on the surface. I move that this matter be referred to the Regional Plant Quarantine Boards for their consideration, and referred later to the National Plant Quarantine Board.

CHAIRMAN HADLEY: The motion, as I understand it, is that this matter be referred to the Regional Plant Quarantine Boards for their consideration, and referred later to the National Board. Is there any discussion?

The motion was voted upon and carried.

MR. FAXON: Another question that has come up quite a number of times with us is in regard to what constitutes an altered certificate. A good many of our nurserymen like to have their certificates printed in large numbers on account of the cheapness and have a good many of them left over from one season to another, and according to our attorney

general, if they cross out the old number and the old date and insert the new number and new date, that would not be considered an altered certificate. I am wondering how many states would accept certificates that had been changed in ink by a nurseryman.

CHAIRMAN HADLEY: I might say in the case of Pennsylvania we have ruled that changing the date of the printed certificate constitutes alteration. That has never been taken up directly with the attorney general; we ruled arbitrarily that the printed certificate changed as to date or anything else rendered it invalid, and told them to act accordingly.

MR. MAX P. ZAPPE: I think the nurserymen in Connecticut get around that by leaving the space blank on their printed certificates and simply writing in with ink the number of the certificate and the date that it expires.

MR. DEAN: If a number is crossed out or erased and another number put in, we consider that invalid.

CHAIRMAN HADLEY: Is there any further discussion? If not, we will go on with the next paper on the program by C. W. Stockwell.

THE INSPECTION OF VEHICULAR TRAFFIC AS PRACTICED IN THE ENFORCEMENT OF THE JAPANESE BEETLE QUARANTINE[1]

By C. W. STOCKWELL

ABSTRACT

The effectiveness of the Japanese beetle, (*Popillia japonica*) Quarantine depends largely upon the establishment of a force of uniformed road inspectors maintained at the outer boundary of the Quarantined Area to inspect traffic for certified and uncertified shipments of restricted articles.

The effective enforcement of the Japanese Beetle Quarantine depends largely upon the amount of check-up made on the movement of restricted articles from the regulated area. The methods of transportation used to move the various types of products are many, but the purpose of this paper is to discuss only methods of inspection as applying to traffic over the highways.

The Japanese Beetle Quarantine prohibits the movement from the regulated area of nursery and greenhouse stock, sand, soil, earth, peat, compost and manure, throughout the year, and certain farm products between June 15 and October 15, unless certified for shipment. Included within the area are hundreds of nursery and greenhouse establishments growing large quantities of nursery and greenhouse stock; also thousands of farms growing produce for distribution to points

[1]Contribution No. 21 Japanese Beetle Laboratory.

beyond the regulated zone. The greatest movement is during the summer months when farm produce is being transported to outside markets by truck loads and smaller quantities are carried by individuals in private automobiles. Nursery stock is carried in varying quantities at any time during the spring, summer or fall.

In order that the public may be adequately informed as to the limits of the restricted area, conspicuous signs have been placed on each road leading from the area, stating that the transporting of certain products beyond that point is prohibited unless certified by the Department of Agriculture. In addition to these signs, it has been customary to station road inspectors on the principal highways at the quarantine line to inspect traffic moving out. Due to the difference in laws in the States it has not been advisable to enforce regulations for the stopping of traffic uniformly in all States, but in general the instructions to road inspectors have been to stop all trucks and such pleasure vehicles as show evidence of carrying quarantined articles. If it were permissible to stop all traffic, it would be impossible on certain highways near large cities due to the immense volume of traffic. At one inspection point on Sunday nights, automobiles pass at the rate of 2,400 per hour. An attempt to interfere with the free movement of this traffic would immediately cause a tie-up. Trucks, however, are required to follow the outside line,where they may be stopped.

The inspectors are on duty and posts are covered for varying lengths of time, depending on the importance of the various roads. It has always been the policy to cover the main trunk roads for the longest periods of time, some of which roads are patrolled 24 hours a day, the inspectors being on duty for 8-hour shifts. In some localities the roads are covered but 16 hours a day, the inspectors being on duty during the hours when most traffic is moving. On still other less important roads but one inspector is placed, and only then during the hours of heaviest traffic movement. In Pennsylvania for the past two years a different method of operation has been in use. In that State the inspectors have been supplied with Ford roadsters, the territory divided into districts and each inspector assigned certain roads to patrol, spending most of his time on those most important, but frequently visiting back roads to check up on traffic there. All inspectors are under the supervision of district supervisors, whose duty it is to visit each man at least one or more times daily. These supervisors being in daily touch with the men are able to keep them fully advised as to any changes in regulations, or any matters upon which they are to be particularly alert.

Supervisors also visit the men at irregular intervals, and do not follow a daily schedule.

Previous to 1926, only a small portion of the road inspectors were uniformed, but during the past season all inspectors on the roads wore uniforms consisting of oxford gray whipcord breeches, gray shirt, black tie, puttees and shoes, and uniform cap with badge. This outfit was considered regulation and all men were required to wear it while on duty. This uniform did much toward gaining the respect of the travelling public, as all the men looked well in their uniforms and were a credit to the service. The results gained and the favorable comments from outsiders coming in contact with the road inspectors were sufficient to warrant the continuance of the uniformed inspector.

Some of the important quarantine posts were located at isolated points on the roads and it was necessary to supply lights at night. This was done either by connection with local service lines for electric light, or by use of carbide lamps. The electric illumination is much more satisfactory, as more light can be obtained. At the two most important inspection stations in New Jersey, large electrically-lighted signs were used, and in addition three large lights with proper reflectors to light the roadway at the point where traffic was stopped. Also at these points booths were placed for the use of the inspectors. At each of these two stations an average of from 75 to 100 trucks carrying farm produce were stopped each night throughout the summer season. As each truck was stopped, inspectors made a record of the certificate, checking the load carried with the amounts recorded on the certificate, also looking for alterations and void certificates. If everything apparently checked satisfactorily, the truck was allowed to proceed, if not, the load was refused movement out of the area. Occasionally truckers proceeded after being notified regarding quarantine regulations, in which cases they were usually taken before the local magistrate and fined. During the season of 1926, fewer violations occurred than previously, due to more cooperation of the State Police and the knowledge of the numerous fines imposed the previous season. No trouble was had with the larger truckers or growers, as they invariably complied with the regulations, but occasionally those less well informed, including foreigners and others but recently included within the extended area, would attempt to get by without certification. In New Jersey during the season of 1926, approximately 10,000 truck loads of produce were investigated at the quarantine line, the few found without certification were turned back and directed to an inspection point established within the quarantined area.

The State Police have been very helpful in the prosecution of the work, particularly in Pennsylvania, where 10 to 15 State Troopers have been assigned to the work with Japanese Beetle road inspectors each summer. The State Police were assigned to work with the inspectors on night duty patrolling the principal highways in the vicinity of the quarantine line.

In the past it has not been possible to continue the road inspectors over as long a period as desirable, although plans for the coming year anticipate the development of a permanent force for this particular phase of the work. With such an organization operating continuously at the limits of the quarantined area it is believed that greater efficiency of the quarantine might be gained.

MR. STOCKWELL: The government does not supply the uniforms. The men are required to buy their own uniforms. The uniforms used this season were not very expensive; they ranged around ten to fourteen dollars. We supply the caps, but the rest of the uniform is supplied by the individual.

MR. MONTGOMERY: Are the inspectors vested with police power, to search, seize and arrest?

MR. STOCKWELL: The inspectors have no police power. In Pennsylvania where they work with the police, the police of course would take the violator before a magistrate. The inspectors can do that as well. If there is any violation the case is taken into court later on.

MR. MONTGOMERY: The inspector cannot himself issue the summons to appear in court.

MR. STOCKWELL: No. We have very good cooperation in New Jersey and Pennsylvania with the state police, and on the principal roads which are near police headquarters, we are able to get police on very short notice. Occasionally if a man insists on moving out of the area, the police head him off before he goes many miles and bring him back. That has been done a number of times.

DR. MARLATT: Mr. Chairman, in Pennsylvania do your state inspectors have power to arrest and hold in a case of that kind, or must you appeal to the state police?

CHAIRMAN HADLEY: Under our Pennsylvania law, our inspectors have the right to stop all kinds of vehicles for inspection, but not to make actual arrest. However, our working arrangement with the police is very nice in that the state police have power of arrest for violation of any act or regulation, but do not have the right to stop for inspection

unless on a clearly apparent cause. By working the two of them, we give the state policemen actual connection with the department as a deputy inspector of the Department of Agriculture, which gives him the authority to stop any type of vehicle for inspection on suspicion. You know you can suspect anything you want to, which is the beauty of that law. But on the contrary the state police do not give our own inspectors the right to make arrest. In that case, the inspector must go to the nearest magistrate and have a warrant sworn out which can then be served by a state policeman or any other police officer, county detective, or any other type of officer.

DR. MARLATT: Are the Federal inspectors given state powers in Pennsylvania?

CHAIRMAN HADLEY: Yes. The Federal inspectors on the Federal payroll are given specific status on the state department, furnished with a badge and a card of identification certifying that they are engaged in duties under the supervision of the Department of Agriculture.

The state police are used largely at night and on some of the more heavily congested roads. Very few people fail to stop during the daytime on signal of our inspectors. The state police department pays the men's salaries and our department pays the other operating expenses, furnishing the machines, and so on.

We will go to the next paper under this subject, by L. H. Worthley.

INSPECTION OF VEHICULAR TRAFFIC IN ENFORCEMENT OF THE EUROPEAN CORN BORER QUARANTINE

By L. H. WORTHLEY, *Administrator in Corn Borer Control, U. S. Bureau of Entomology*

Federal Quarantine No. 43, on account of the European corn borer, regulating interstate movements of quarantined products, and State quarantines regulating intrastate shipments within the areas infested, are being enforced to prevent further spread into non-infested areas. Enforcement has been directed by the Federal Hoticultural Board and the United States Bureau of Entomology, in cooperation with the various States.

The possible spread of the pest through artificial means is an important factor. All vehicles leaving the quarantined areas are stopped at the border. Inspection of this vehicular traffic varies in its operation. The passenger-carrying automobile is the vehicle most concerned in this inspection work. The following types of vehicles also are included: auto-trucks and horse-drawn wagons. Steamboats and river-boats also constitute great possible agencies for spreading infestation.

The greatest amount of attention to vehicular traffic inspection was given at the quarantine lines in Pennsylvania, Ohio, and Michigan, our objective being to prevent long-distance spread. Results indicate the work as being important, necessary and effective.

Uniformed inspectors were stationed on all roads leading from infested to non-infested areas, all outward-bound vehicles being stopped and searched for ears of green corn, stalks, etc. As a means of attracting the attention of all drivers, road banners, quarantine signs, stop signals, lanterns, flashlights, and high-powered carbide lights were used. This work was conducted for twenty-four hours each day during the sweet-corn season. On the most important main roads a three-shift force was maintained. Army tents were provided for inspectors, who camped on the spot. In addition to these inspectors, assistance was rendered by state motor-cycle officers and constabulary officers. These officers were shifted on short notice to patrol back roads and intercept hucksters and others who might attempt to avoid the inspectors stationed on the main highways.

In 1926 forty quarantine lines were operated on the roads bordering the quarantined area in Ohio and six additional interstate lines were conducted at the Ohio-Indiana State boundary. Forty lines were operated in Michigan and ten lines in Pennsylvania.

Quarantine lines have been operated during the past four seasons in the middle western territory and, during the last two seasons, have been generally accepted by the traveling public as necessary and important, the inspectors experiencing but little trouble in enforcing regulations. In Ohio, during the 1926 season, with approximately one million automobiles stopped, only 429 refused to obey the inspector's signal, and these machines probably were engaged in some unlawful enterprise. Out of a total of 800,000 machines stopped in Michigan, 754 refused to respond to signals. In Pennsylvania 341,888 cars were stopped and only 116 similar violations occurred.

In the New England area during the present season, i. e., from June 1 to December 15, the following farm products were permitted and certified at Boston, Mass., for shipment to points outside the quarantined area, viz: 15,793 bushel boxes of green beans, 5,568 bushels of bunch beets, 22,831 bushels of celery, 618 bushels of rhubarb, and also 1,861 bushels of green corn on cob which was grown outside the infested area, making a total of 46,671 bushels of farm products. During the same period the following cut flowers were inspected and certified at Boston for shipment to points throughout the United States, viz: 98,994 asters,

265,476 chrysanthemums, 1,022 cosmos, 344 dahlias, 89,763 gladioli, 18 hollyhocks, and 1,891 zinnias, making a total of 457,498 cut flowers grown in the infested area.

These shipments went by rail, by water and over the highways in long-distance trucks. The railroad companies, steamship lines and express companies have shown a sincere desire to cooperate with the government in enforcing the quarantine regulations, but, unfortunately, no such friendly spirit of cooperation has been in evidence with the automobile trucking concerns. The shipment of farm produce from the Boston wholesale district to northern Maine, New Hampshire, Vermont, New York, western Massachusetts and northern Rhode Island and Connecticut, by long-distance covered trucks has increased tremendously in recent years and this method of shipment affords the easiest means of evading the quarantine regulations and the hardest problem of the inspectors, whose duty it is to see that no quarantined products are carried from within to points outside the infested area without permit or certificate.

The various State plant quarantine acts have been drawn along similar lines in all respects but the authority conferred by the General Laws, under which these acts were promulgated, varies considerably; consequently there is more or less variance in the methods of dealing with violators. Cases which are pigeonholed or held pending in the courts of justice lose their force and good effect.

Adequate Federal and State legislation to enable and provide strict enforcement of the law so as to bring violators to immediate trial and conviction in local courts is absolutely necessary to the efficient enforcement of quarantine regulations. The best present example of such cooperation is that now existing with the State of Pennsylvania where, during the past season, out of a total of 116 intentional violations, 114 of the offenders were immediately tried and convicted.

While the stopping and examining of vehicles has been fairly successful the past two or three seasons, considerable publicity has been given through the medium of middle western newspapers to the fact that we have been operating on "bluff." The one exception to this condition is Pennsylvania, where adequate regulations are in force with the exception of the desirable provision to confiscate contraband material and destroy the same. It is anticipated that next season, with the knowledge the public has gained through the unfavorable publicity, inspection at quarantine lines will be greatly handicapped as the public probably will demand its rights under the present law in this matter.

The present regulations therefore should be reinforced by additional Federal and State legislation. It has been suggested to the States concerned that a Special Act containing adequate authority be passed by their legislatures to enable regulatory officials to do this work in a legitimate manner.

The following figures summarize the work on quarantine lines in the States of Ohio (1922 to 1926, inc.) and Pennsylvania and Michigan (1925–1926):

Total number machines stopped	6,491,491
Number refusing to stop	6,743
Ears of corn taken	403,469
Number of European corn borers in seized corn	5,591

MR. WOOD: Mr. Chairman, I would like to ask Mr. Worthley if he has any data indicating where the machines were going that were stopped. How far would they have gone outside the corn borer region?

MR. WORTHLEY: In 1925 I believe we stopped 300 machines that were going more than 100 miles, and this year we stopped three machines going to Iowa. We stopped two that were going to Florida. One of them was carrying "corn on ice," and intended to renew it on the way down. Surely hundreds of them were going into Illinois and parts of southern Indiana and into Kentucky.

DR. MARLATT: I find there is no place in the Association program for a discussion of large subjects of interest to many of us here, namely, the corn borer quarantine and its operation and outlook and the Japanese beetle quarantine. I wonder if that is provided for in any programs that are to follow. If not, it might be a good plan to open up those subjects for an informal discussion later in the day. I am speaking now purely of the quarantine and control side.

MR. A. F. BURGESS: I didn't hear quite all that Dr. Marlatt said. I would like to say just a few words in connection with the gipsy moth quarantine which has been in operation practically since the Federal Horticultural Board was established, that is, the general operation officially. Prior to that time it was an informal quarantine made by arrangements with the railroads and common carriers. At one time when the brown tail moth was very abundant in eastern Massachusetts, arrangements were made with the railroads to inspect the through trains, because it was found that the moths were being carried to some extent, particularly on the engines around the headlights and in the Pullman cars when bright lights were present.

These inspections were made by arrangement with the railroads at points en route where engines were changed and the trains were held up for a few minutes. Later on inspection was made in cooperation with the railroads, of the products that were shipped out of the infested territory.

After the Plant Quarantine Act was passed and the gypsy moth quarantine was enacted by the Federal Horticultural Board, most of the quarantine activities were taken care of under those provisions. We have, though, from time to time, done a certain amount of road inspection where there seemed to be danger of material going out on vehicles. During the past few years we have done some road inspection, particularly in connection with the shipment of Christmas trees from the quarantined area to points immediately outside, where those trees might be carried by trucks or by tourists or others who were going a short distance.

We have in that work encountered very little opposition from the public. When trees were found on vehicles that were stopped, the owner had the option of leaving the trees or of taking them back inside of the quarantined border, if the station was outside of the border, and having them inspected and certified before they passed on.

Your Secretary asked me to prepare a paper in connection with this matter, but owing to the fact that there seems to be so little legal authority for doing this work, it seemed to me results could be accomplished better by conference than by giving too much publicity to the weakness of the legal phase of this operation. I understand, however, that the subject has been discussed quite freely in some sections in the press, and it seems to me there is urgent need that inspectors have more authority to stop vehicles and make inspections.

I hope very sincerely that some action will be taken as the result of this group meeting here at this time to assist in bringing about this most needed legislation, not for the states but for the Federal Government.

MR. WORTHLEY: In addition to that I might say a corn borer conference was held in Detroit the latter part of September, and it was brought out there by one of those attending that we are operating our quarantine lines entirely on bluff. That was immediately taken up by the Chicago Tribune and from the Tribune it went to 250 newspapers in the Middle West, so that it got an excellent amount of publicity. By another season we must have something else.

CHAIRMAN HADLEY: I might say with reference to Dr. Marlatt's suggestion, which I think is very good, that we are pretty well along on the program and we may have opportunity to bring up some other questions which are perhaps of more general interest.

Tuesday Afternoon, December 28, 1926

The meeting convened at one-fifty o'clock, Dr. S. B. Fracker presiding.

CHAIRMAN S. B. FRACKER: Mr. Hadley has asked me to substitute for him this afternoon, and as it is already past time, we will begin now.

The first paper is by Mr. Warner.

FLORIDA QUARANTINE—AMERICA'S PROTECTION AGAINST PLANT PESTS OF THE AMERICAN TROPICS

By L. R. WARNER

(Withdrawn for publication elsewhere)

DR. C. L. MARLATT: I was very much interested in hearing this paper. I want to express again the appreciation which the Department of Agriculture feels, which we all feel, for the service which Florida and California are rendering in protecting the United States against these pests, a service which has a value that cannot be estimated in dollars, or at least it would run into war figures very rapidly. It is a service that we are making the utmost use of—the protection of the ports of Florida and California is entirely done by these two states and the Federal Government is relieved from any responsibility or at least from any expenditure for work in connection with that service. I say relieved from any expenditures; we do have State officials commissioned as collaborators of the Department of Agriculture and give them the authority of officers of the Department in the enforcement of Federal quarantines and pay them, but their stipends are merely nominal and it is a tremendously valuable service.

There is no question that the protection by these two rather strategic states is on a much higher plane than it is anywhere else in the United States.

DR. WILMON NEWELL: Mr. Warner spoke of the fact that very much material was brought in from foreign countries without any intention of violating the law. That is probably true. The quarantine and customs inspectors, of course, have such a large number of people to deal with and have such a tremendous task upon their hands that they depend very largely upon their estimate of human nature in their

inspection work, but it is not true that because a man is posted on the laws of the country that he is willing to abide by the laws of that country.

I was somewhat dumbfounded not very long ago to find that the dean of a law college in a well-known university of this country smuggled in through Key West a living plant from a black-fly-infested territory. He successfully got by the customs inspectors and quarantine inspectors, took that plant home and planted it in his own home town.

There, is an example of a man who knew the law and knew he was breaking the laws of his country, a man who certainly must have known some of the danger attached to doing that particular thing, and because he was intelligent and apparently a man of means and a man of consequence, the inspectors perhaps didn't go quite as far into his baggage as they would into the baggage of some person of lower intelligence. There, is the person who smuggles for the purpose of trying to defeat the laws of his own country. Perhaps some of you who are engaged in quarantine work will want to bear this particular instance in mind because there is a factor which is very hard to deal with.

DR. C. L. MARLATT: Mr. Chairman, as I have seen the state inspectors working, I think they do the work regardless of the importance of the individual. I have had a number of distinguished gentlemen who crossed the Pacific from Honolulu, come back and report to me that they were stopped and their baggage gone through with a finetoothed comb—members of Congress, and others. I have yet to find any of them who objected to it. They were glad to see it.

I have a great deal of confidence that these men in Florida and California as well as our own men, are doing their work regardless of persons.

MR. MAX KISLIUK: In regard to letting certain officials and well-known characters get by, I know from personal experience that very often an official of some foreign government or a prominent citizen of this country who may be coming back from abroad may get a courtesy of port by letter to the collector of customs. The collector of customs will forward it to the boarding officer, who is the first customs officer to approach a ship, and from the boarding officer it will go down the line to the inspector at the dock, all granting this particular individual or individuals the courtesy of the port. As far as my experience goes with this courtesy of port, there is very little inspection of baggage. If they have any suspicions, they may open one or two bags or a trunk, but they do not go through it as thoroughly as they would with an ordinary citizen.

DR. C. L. MARLATT: I know there are difficulties of that type, and especially in the army and navy. We have had to take up several cases with the Secretary of the Navy who has given us absolutely full support. We have had similar difficulty with army transports. I have one case on my desk now that we are going to take up with the Secretary of War. As a rule, we can get proper explanation or adequate support as far as the Secretary is concerned.

I may have told you of an incident indicating the lack of weight given to persons in power. A shipment to the wife of the President of the United States was held. It came through diplomatic channels. An inquiry was made about it from the State Department and a report made that such plants for personal use were not allowed to come into the United States. We could not make exceptions for any citizen, The State Department said we were quite right and we would never hear anything more about it. I met the private secretary of the President's wife a month or two afterwards. I happened to mention this incident. "Ah," she said, "we had a letter about those things. We have been looking for them ever since. We didn't know what became of them."

CHAIRMAN S. B. FRACKER: If there is no further discussion, the next paper is by A. G. Ruggles and J. D. Winter.

RESULTS OF THREE YEARS' EXPERIENCE IN THE CONTROL OF MOSAIC IN RED RASPBERRIES IN NURSERIES

By A. G. RUGGLES AND J. D. WINTER, *St. Paul, Minnesota*

ABSTRACT

Roguing for the control of mosaic in red raspberry plantings has been carried on by the Minnesota nursery inspection service for the past three years. Approximately 125 acres were inspected and rogued in 1925 and about 175 acres in 1926. Each individual bush was inspected two or more times each year. Very careful counts were made during the roguing operations. The data obtained show that the amount of mosaic is steadily decreasing. Even with those varieties in which mosaic was most prevalent in 1923 the disease has been reduced to a very low percentage. A number of plantings now appear to be entirely free from infection. Roguing for the control of mosaic in red raspberry plantings seems to be entirely practicable.

Last year before this section we presented a paper on the control of mosaic in plantings of the red raspberry. In this paper four conclusions were given, namely (1) that mosaic can be effectively controlled by roguing (2) that isolation from nearby sources of infection is essential in control (3) that detection of the very early stages of mosaic is necessary in control (4) that mosaic as diagnosed under standards of inspection in Minnesota is definitely systemic. These conclusions were reached

from the study of data obtained during 1924 and 1925. It seems proper at this time to present further data on the control of mosaic by roguing obtained through studies which continued during the season of 1926. It does not appear necessary to give further data concerning the other conclusions which were reached as a result of the work during 1924 and 1925.

It became apparent early in the course of work during 1926 that very definite progress had been made in control of mosaic in the raspberry plantings. The data obtained show a consistent reduction in the percentage of mosaic. A number of plantings from which a small amount of mosaic had been rogued in 1925 appeared to remain entirely free from mosaic throughout the season of 1926. In the majority of the other rogued plantings mosaic apparently is approaching the vanishing point.

As in previous years uniform methods were employed in computing the percentage of mosaic present in each planting. Mechanical counters were used in connection with the roguing to reduce the possibility of errors. All computations were based on the number of hills originally planted.

One important change in roguing methods was made in 1926. This was brought about by an unexpected increase of mosaic in four Latham plantings which had been very carefully rogued in 1925. The amount of mosaic found in 1926 in these four plantings averaged only 4.9%, but this amount was unusual in plantings which had been so carefully rogued the previous year. It was very obvious that this spread had occurred principally around the places where one or more diseased bushes had been taken out in 1925. Reference to the records showed that aphids had been abundant in these plantings at the time of the roguing. Naturally the evidence indicated that this unusual spread might have occurred by disturbing the aphids on the infected plants so that they had carried infection to nearby bushes. Therefore, during the season of 1926 wherever aphids were found abundant the infected bushes were burned where they stood before roguing was attempted in order to destroy the aphids. This was usually accomplished by using a small hand sprayer and kerosene. This method also had the advantage of effectively marking all bushes to be rogued so that they could be dug out at any convenient time soon after. In this way it is believed that the possibility of spreading infection at the time of roguing is greatly reduced.

Approximately 175 acres of raspberry plantings in Minnesota nurseries are being inspected at the present time. For the most part these plantings are being grown for the production of plants with fruit production of secondary importance. About 127 acres consist of the Latham variety. This acreage is distributed throughout the state in 136 separate plantings.

The following tables are presented to show the progress which has been made in reduction of mosaic in inspected plantings of the Latham variety during the past three years. The records for this variety were chosen because the Latham is the principal variety of the red raspberry grown in Minnesota. Similar results have been obtained with fourteen other varieties. The red raspberry is grown quite extensively in Minnesota, but commercial plantings of the black raspberry are rare. Control work therefore has been confined largely to the red varieties.

TABLE NO. 1. LATHAM PLANTINGS ROGUED 1924 TO 1926—PLANTINGS MORE THAN ONE YEAR OLD

	Number of Plantings	Approx No. of Acres	Total Hills Rogued	Av. Percent of Mosaic
Rogued in 1924				
Plantings not previously rogued	33	24	3,168	6.6%
Rogued in 1925				
Plantings previously rogued	32	21	1,956	4.6%
Plantings not previously rogued	0			
Rogued in 1926				
Plantings previously rogued	83	88	2,629	1.4%
Plantings not previously rogued	5	2	172	4.9%

TABLE NO. 2. LATHAM PLANTINGS ROGUED 1924 TO 1926—PLANTINGS LESS THAN ONE YEAR OLD

	Number of Plantings	Approx. No. of Acres	Total Hills Rogued	Av. Percent of Mosaic
Rogued in 1924				
Plants from selected unrogued plantings	15	10	records not complete	
Rogued in 1925				
Plants from rogued plantings	67	66	6,316	3.8%
Plants from selected unrogued plantings	23	12	4,865	15.4%
Rogued in 1926				
Plants from rogued plantings	43	32	1,010	1.5%
Plants from selected unrogued plantings	5	5	973	9.9%

Table No. 1 shows that an average of 6.6 per cent mosaic was rogued from 33 plantings which were selected in 1924 as the best foundation stock available for general planting. For this purpose roguing was not

attempted in plantings where more than fifteen per cent mosaic was found.

The following year, 1925, an average of 4.6 per cent mosaic was found and rogued from 32 plantings more than one year old. These plantings included 17 of the original 33 plantings and the 15 plantings which were planted in 1924 as shown in Table 2. Complete records were not kept in 1924 for all the plantings established that year, but in some instances as much as 25 percent mosaic was rogued.

In 1925 isolation from nearby infected plantings was required as a condition for certification. This was not required in 1924. Therefore, many of the plantings certified that first year could not be certified again.

The reduction of mosaic in 1925 as shown by inspection records for 1926 is very marked. It is particularly interesting to note that the amount of mosaic found in 1926 in the older rogued plantings, namely 1.4 per cent, was substantially the same as found in the new plantings of 1926 established with plants from rogued fields. The amount of mosaic in these new plantings averaged 1.5 per cent.

TABLE NO. 3. TOTAL LATHAM PLANTINGS ROGUED 1924 TO 1926

	Number of Plantings	Approx. No. of Acres	Total Hills Rogued	Av. Percent of Mosaic
Rogued in 1924				
Not previously rogued	48	34	records not complete	
Rogued in 1925				
Previously rogued	99	87	8,272	4.0%
Not previously rogued	23	12	4,865	15.4%
Rogued in 1926				
Previously rogued	126	120	3,639	1.4%
Not previously rogued	10	7	1,145	8.5%

Table No. 3 is a summary of Tables No. 1 and No. 2. The average amount of mosaic found in all Latham plantings in 1925 was 5.5 per cent. This figure is not shown in the table but is the weighted average for the two figures given, namely 4.0 per cent and 15.4 per cent. The reduction of mosaic during 1925 is therefore from 5.5 per cent to 1.4 per cent. These figures assume added significance when it is noted that during 1926 only seven plantings failed to pass inspection out of a total of 133 plantings of previously rogued stock. The inspection records for 1927 will indicate what actually has been accomplished during the inspection season of 1926.

Control Methods Recommended

As a result of three years experience in roguing the following methods are recommended for the control of mosaic in nursery plantings of the red raspberry under Minnesota conditions:—

1. Careful inspection for diseased plants should be given by the owner once each month during June, July, August and September. In addition two official inspections should be made each year, the first between June 1 and July 15 and the second between July 15 and September 15. The two official inspections should be made not less than 30 days apart.

2. When an infected bush is found it should be dug at once including all the roots and sucker plants. If aphids are present the bush should be burned where it stands, before digging, to destroy the aphids and other insects. A hand sprayer with kerosene is useful for this purpose. If the planting is more than three to four months old the bushes standing next in the row, if within three feet, should be removed in the same manner. It is advisable to place a stake at each place where a diseased plant has been removed so that sprouts can be looked for and destroyed in case the first digging failed to get all the roots.

3. It is usually not practicable to attempt the roguing of any planting more than one year old in which more than 5 per cent mosaic is found.

4. Mosaic free planting stock usually cannot be grown successfully if infected raspberry plants, either cultivated or wild, are growing nearby. Observations indicate that a separation of not less than 20 rods is necessary. This is the minimum distance required in Minnesota as a condition for certification of any raspberry planting. A greater distance is always preferable where this is possible.

5. When a new planting is started for the production of plants it is advisable to obtain stock from a planting which has been given competent inspection and roguing for not less than two successive years. Plantings in which more than 2 per cent mosaic has been found during the year the plants are dug should not be used as a source of stock for propagation if better plants are available.

6. In selecting a planting site observations indicate that an open or exposed upland location is the more desirable as aphids are usually more numerous in sheltered and secluded places. It is possible that the use of a contact insecticide for spraying at regular intervals during the growing season may sufficiently reduce the number of insects so that the spread of mosaic would be materially retarded. Spraying for

this purpose has not been practiced in Minnesota and it is not certain whether this treatment would be of sufficient value to justify the expense.

Conclusion

Evidence continues to accumulate showing that the control of mosaic by roguing in nursery plantings of the red raspberry is practicable.

Chairman S. B. Fracker: If there is no discussion on this paper, the next item on the program is Reports of Committees. I am informed by the Secretary that under that heading properly comes the reports of the Regional Boards. I will ask Dr. Headlee to report on the work of the Plant Conference Board of the Middle Atlantic and North Eastern States. [The report has not been submitted for publications.]

Chairman S. B. Fracker: Are there any questions on this subject? If not, we will hear from Mr. Glenn, representing the Central State Advisory Plant Board.

Mr. P. A. Glenn reported for the Central State Advisory Plant Board.

Chairman S. B. Fracker: Are there any comments? If not, we will hear from Dr. Newell on the work of the Southern Plant Quarantine Board.

Dr. Newell: "Professor Harned, who is Chairman of the Southern Plant Quarantine Board, is attending another meeting just at this time, but before leaving the room asked me to report, for him, on this matter.

"The southern regional board was organized at Atlanta last February. Professor R. W. Harned, of Mississippi, was elected Chairman, Mr. W. E. Anderson, of Louisiana, Vice-Chairman, and Mr. B. P. Livingston, of Alabama, was made Secretary. A constitution was adopted and Mr. George C. Becker and myself were designated as representatives on the National Plant Board. Later, following Mr. Becker's resignation, the executive committee of the regional board selected Mr. R. W. McDonald, of Texas, to serve as representative on the national body.

"The southern regional board has concentrated its efforts primarily on the task of harmonizing, as far as possible, the state regulations in the southern states and to this end has a very active committee at work on this problem, this committee consisting of Dr. J. H. Montgomery of Florida, Mr. H. J. De LaParelle of Georgia and Mr. George F. Arnold of Mississippi. This committee will submit its report at the next meeting of the Southern Plant Quarantine Board, which will be held at Atlanta about February 1st."

CHAIRMAN S. B. FRACKER: We will ask Mr. List to report for the Western Plant Quarantine Board.

WESTERN PLANT QUARANTINE BOARD

The Western Plant Quarantine Board held its annual meeting for 1926, at Olympia, Washington, from June 9 to 11. The officers elected for the ensuing year were as follows: President, Dr. Oscar C. Bartlett, State Entomologist, Phoenix, Arizona; Vice President, Mr. Geo. G. Schweis, Deputy State Quarantine Officer, Reno, Nevada; Secretary, Mr. W. C. Jacobsen, State Department of Agriculture, Sacramento, California.

The members on the plant advisory board are M. L. Dean, Boise, Idaho, and Lee A. Strong, Sacramento, California.

The relation of the recent Supreme Court decision to the plant inspection and quarantine work of the West came in for considerable discussion. It is felt advisable for most of the western states to reenact their basic laws. A movement was started to make these as uniform as conditions will permit when they are reenacted, and the executive committee has drawn up certain suggestions that should be worked into as many of these laws as possible. The effort to make all regulations issued on any one subject as near uniform as local conditions will permit, is being continued.

GEORGE M. LIST

CHAIRMAN S. B. FRACKER: The next subject on the program is the report of the Nominating Committee.

MR. J. E. GRAF: Your Committee on Nominations submits the following names for this Section: Chairman, Dr. J. H. Montgomery; Secretary. W. B. Wood.

CHAIRMAN S. B. FRACKER: This report is before you for consideration. What action will be taken?

It was moved and seconded that the report be adopted and the men named be elected. The motion was carried.

CHAIRMAN S. B. FRACKER: That completes the program, with the exception of the conference that was proposed this morning on the various regulations and quarantines of the Federal Horticultural Board. I think Dr. Marlatt should act as chairman of such a conference. If there is no other business to come before this group, I will turn the meeting over to Dr. Marlatt and ask him to act as Chairman of the conference at this time.

DR. C. L. MARLATT: As I indicated this morning, I feel that this body each year should include in its program some sort of review of the important quarantine subjects which are being worked on in this country with the Federal Government and states cooperating. They represent the job of all of us and they are the big points of interest. We may discuss some of these details, but we should have each year a sort of round-up on the essential progress, the essential status of big projects—I mean the moth project under Mr. Burgess, the corn borer project which has its field direction in Mr. Worthley, and the Japanese beetle project with Mr. Smith in charge, and perhaps the pink boll worm project which is of interest to all of our southern members, and the related project of the Thurberia weevil, which has come up more recently.

These are all matters which affect large interests of the country and should be a part of our program in the future. They are rather left out on this program and left out on the program of the Entomologists, and unless we have an opportunity like this to set the present situation before you, a half dozen of the most interesting subjects that the entomologists of this country are working on would go practically untouched.

A good deal of water has gone over the dam in connection with the corn borer. There are various propositions in the air and possibilities likely of accomplishment which should, it seems to me, be brought to the attention of all of us, because we are all interested. You will be called upon to cooperate in some way or other before long.

I don't see Mr. Worthley here. I wanted to call on him now to tell us about the corn borer, and then the other subjects will come along, Mr. Chairman, and when you come to the pink boll worm, I will be glad to give you a little epitome of that and perhaps of the Thurberia weevil.

CHAIRMAN S. B. FRACKER: I take it that the subject for discussion, then, is the present status of the Japanese beetle, the Federal and state regulations for its control, and any suggestions or comments that the entomologists may have on the Japanese beetle regulations and the status of the work.

We should hear first from Mr. Smith, I believe.

Mr. L. B. Smith addressed the meeting on the Japanese beetle.

CHAIRMAN S. B. FRACKER: The entire subject of the Japanese beetle regulations is now open for discussion by any who are interested in the subject.

DR. L. S. MCLAINE: I would like to ask Mr. Smith if it is going to be the policy this next summer in connection with a market such as New York to certify all the market produce, as has been done in the past, or will the packages be certified in some way before they leave the market to indicate that the system of packing is approved?

MR. SMITH, in the discussion which followed, stated that there would be a flat embargo on the movement of green beans and sweet corn from the New York market to outside points. He explained that the distributing business of the commission men had become quite local in contrast to what it was a few years before when they fed most of the western New York cities, as well as many of those in New England. For this reason the embargo on outgoing vegetables was to be preferred by all parties concerned rather than a system of inspection and certification.

It is not anticipated that the New York markets will become infested as did the Philadelphia market for a number of years, as it is a distance of forty miles to the nearest point where the Japanese beetle occurs in any numbers, which is much beyond their distance of flight.

Corn from New Jersey going to New York is shipped in bags which are not opened in the market, but are distributed to the small local markets from whence the corn goes to the hotels and general populace.

Nearly all fruit entering the New York market is graded. The ungraded fruit picked fresh from the trees and shipped in open baskets nearly all moves to the south and west, much of it going to the mining towns of Pennsylvania.

MR. WORTHLEY spoke at length on the operation of the European corn borer quarantine as it has been carried on since the work began. He discussed the methods employed in the past and pointed out that in spite of all that was done the spread of the insect had continued from year to year. Mention was made of the meetings held in Chicago on June 3, 1926, and in Detroit on September 25 to discuss the situation. As a result of these meetings which were attended largely by experiment station directors, secretaries of state and others having large interests in the "Corn Belt" an appropriation of $10,000,000 is to be requested of Congress to carry out a cleanup campaign on the edge of the infested area and beyond in an attempt to prevent the further spread of the insect.

Some of the difficulties encountered in enforcement of the quarantine were mentioned.

DR. C. L. MARLATT: If I may add a few words in supplementing what Mr. Worthley has said, I think he has put a very plain statement of the situation before you. I think he made it clear in the first place that this movement, this gigantic demonstration, experiment, came up from the states. This committee that he refers to is a committee representing the corn borer states. It is headed by Mr. Curtis of Iowa, Dean of the division of Agriculture and Director of the experiment station—and is a committee of western men representing big interests in the West, experiment station men, secretaries of agriculture, et cetera, who became impressed with the fact, as Mr. Worthley has pointed out, that the corn borer ought to be stopped, after having seen its work in Ontario and waking up to the situation for the first time, and that the government should do a good deal more than it was doing to stop the spread.

As Mr. Worthley said, their idea was a gigantic demonstration control plan which would show what could be done to stop the spread, the idea being to clean up the corn in all this western area, two million and a half acres perhaps, a strip from fifty to one hundred and twenty miles across that represents the western band of the spread of the insect, an area in which the insect now occurs in very limited numbers and where it is found with the greatest difficulty.

The thought was that if you could clear up the corn stubbles, the stalks and every part of the plant in the fall and winter so thoroughly that the corn borer population would be reduced to the lowest element, just by the amount of that reduction you would reduce the risk of spread. No one can deny that corn is the carrier of the insect in the West; it hasn't spread very much yet to other plants, practically not at all. Such a reduction of the corn would have the effect of reducing the corn borer population enormously, and that is the basis for the experiment. If the experiment works, it won't eradicate the borer as Mr. Worthley said, but if the experiment succeeds in reducing the abundance of the pest to the minimum, it may prevent spread or slow up spread so much that it will give protection to the great corn belt which is just now being reached, which will be worth the expenditure of $10,000,000. That is a financial question that it is up to Congress to settle, but this proposition came up endorsed by quite a number of leaders of these western states and it is still in their hands. It was presented to the Budget Committee and quite an appeal was made.

There is just one other point I want to mention in this connection and that is the question of reimbursement. It isn't a pleasant thing,

to consider the beginning of a policy of reimbursement for farm work, clean-up work which the farmer ought to do. I don't know what the original idea was because I wasn't in any of the early meetings. I have only met twice with the committee, and then for a short time. The thought is, as Mr. Worthley pointed out, that there will not be any reimbursement to the farmer for any normal, reasonable and usual farm work, but if he is required under state law to do work that is unusual, additional and above his ordinary work, in other words, if he has to assume considerable and heavy cost to carry out the program of this experiment, he has a right to be reimbursed for that additional labor. The work can be done either directly by the state and Federal Government employing men to do it, as we employed men and cleaned up in the cotton clean-up work of the South where the expense was entirely Federal expense, or it can be done by the farmers. We didn't reimburse farmers for the work in the South because we did it ourselves.

We can ask the farmer to do it, not only ask him but compel him to do it, tax him or go in and do it for him, putting a tax on the land to represent the amount. That is the scheme these men have in mind. If he does the work he has an equitable right, I think in a sense, to be paid for that extra work. It isn't reimbursement, it is being paid for work which he is forced to do which he wouldn't normally do. If it were merely subsidizing the farmer to get him to do his normal work, I don't think there would be a moment's consideration of the proposition.

DR. T. J. HEADLEE: Suppose the scheme doesn't work out and the $10,000,000 experiment is a failure? What plan is there for taking care of such a situation?

DR. C. L. MARLATT: That is entirely outside and unrelated to the quarantine control work which is being done under Federal appropriation. It doesn't affect that work at all. That stands on its own feet. This appropriation, this gigantic demonstration experiment, will come to an actual and proper end if it demonstrates its futility. If it demonstrates any great utility, then it will be up for a subject to be properly considered as to its continuation. I put that question up to this committee myself and they were a little hazy on that point. Their idea seemed to be that if it worked, the results would be so large that it wouldn't need to be repeated, that the farmer himself would probably be able to take hold of that work and carry it on in the future. I think we all have reason to doubt that this would be done.

CHAIRMAN S. B. FRACKER: Before going further on this I would suggest that we hear from Dr. McLaine on two phases that appeal to

me—the clean-up work that is being carried on and that will be carried on in Canada and the relation of the Dominion Government to the new shelled corn regulations.

MR. MCLAINE: Replying to the chairman's questions with regard to what is being done in Ontario to control the European corn borer, and the danger of shipping shelled corn, it may be of interest to those present to review very briefly the situation as it stands today, although this matter will be discussed at greater length later in the week. During the past season the corn borer was found to have spread to sixty additional townships as compared to twenty-five in the previous year, and five in 1924. In Ontario it now covers approximately thirty-five thousand square miles. Outbreaks have also been found at two separate points in the province of Quebec, one of these is due to natural spread from Ontario, and the second to spread from New York State. The severely injured area, covering about four hundred square miles in southwestern Ontario in 1925, has now increased to twelve hundred square miles.

With regard to control, this matter is in the hands of the provincial and not the federal authorities, other than prevention of spread and quarantine enforcement. In 1925 the European Corn Borer Control Act was passed by the Ontario Parliament, the Act was amended at the 1926 session and in July of this same year regulations under the Act were promulgated. In accordance with this Act the Provincial Entomologist has authority to apply the regulations for controlling the pest to any county in which it exists, and to appoint inspectors to see that the control operations are being carried out. One-half of the salary and expenses of an inspector must be paid by the county or municipality in which he is working and the balance is paid by the provincial authorities. The regulations require that every person growing corn in the counties in which the corn borer act has been made effective, shall adopt such methods in the growing of corn, in handling the land and the remnants of the crop as will most effectively control the corn borer; the regulations further define just what action must be taken by the grower for controlling the borer. In the case of any grower, owner or occupant of any premises who refuses to comply with the regulations, the control work shall be carried out under the supervision of an inspector and the cost thereof shall be placed as a lien against the property, and be collected with the regular taxes. Provision is made for the penalizing of any individual who refuses to carry out the instructions of an inspector or who obstructs the inspector in the performance of his duty.

This act has been applied by the Provincial Entomologist, to eight of the most seriously infested counties of the province, and if the situation warrants it, the act will be extended to other counties next year.

With regard to the shipping of shelled corn, this matter has been carefully investigated and it would appear that there is but little if any danger in spreading the borer provided the corn has been thoroughly cleaned, but there is undoubtedly danger if the cleaning is not thorough and pieces of cob or other refuse are not removed. The question of certifying all shipments of cleaned shelled corn from the quarantined area is now receiving serious consideration.

DR. C. L. MARLATT: We couldn't do less than our friends across the line and in corn countries we have to require a certification of clean shelled corn as a condition of movement in the United States as well as a condition of movement between states.

DR. E. P. FELT: May I inquire why shelled corn is brought in under quarantine? Is it because it is not clean?

DR. C. L. MARLATT: The shelled corn frequently has a large percentage of cob in it and the corn borer has a habit of spending the winter in the cob.

Mr. Worthley, and men who have been in charge of the quarantine work, could tell you better than I. They have reached the conclusion that clean corn, that is, well cleaned, free from extraneous matter other than the clean grain, is practically safe as far as the corn borer is concerned, and the whole purpose of this inspection is to determine just that condition, that the corn is clean grain.

CHAIRMAN S. B. FRACKER: The entire subject of the corn borer is now open for discussion.

DR. C. J. DRAKE: We have been very much concerned over certain territory not included in the Federal quarantine, in the infestation in Long Island and in Connecticut and Staten Island. About two years ago we received a carload of corn on the cob from southern Connecticut, from near infested territory. I knew nothing about this shipment until after it had landed. It seems that Newark heard about the infestation in Connecticut and called the county agent. I would like to ask Mr. Worthley how long certain territory has been infested in southern Connecticut, Long Island, and New Jersey.

MR. L. H. WORTHLEY: There has been infestation in Connecticut I believe three years.

DR. C. J. DRAKE: We can't see why there is any exception to the quarantine. We feel all infested territory should be included if it includes any.

MR. L. H. WORTHLEY: The matter of shipping corn on the cob, the product you have reference to, from where the seed corn is grown, has been gone into very thoroughly by Dr. Britton and myself, with the growers there. They don't want to ship any corn out on the cob. We found just one corn borer in those two townships that grow the seed corn which is shipped outside, and that was only found this last season. The infestation heretofore has been up in eastern Connecticut. There was considerable distance between that and the Rhode Island infestation, and the infestation is extremely light. It has been cleaned up each year by Connecticut, and the same condition prevails on Long Island. The infestation there is almost entirely in the weeds, with the exception of one section, and that is being cleaned up and will be cleaned up very thoroughly by the State of New York and the Federal Government.

We are as much interested in this as you folks are and if we found it was necessary to quarantine this area we would be very glad to do so. It is an easy matter to quarantine a place but it is another thing to operate, and if you feel that you are just wasting the money, what is the use of doing it.

DR. C. J. DRAKE: This matter I think deserves careful consideration. I feel we are making a mistake by making an exception to the present quarantine. I don't see why there should be an exception.

I should like to ask another question. Dr. Marlatt stated this morning that Texas and California had passed certain restrictions on the movement of cotton products. Has the cotton quarantine exceeded the present Federal quarantine?

DR. C. L. MARLATT: You refer to the fact that I mentioned that Texas and California had passed restrictions on the movement of products out of areas in a sense that might be perhaps considered as a violation of the principle established by the Supreme Court decision and the amendment.

I think I presented those matters in the light that a new question was raised which hadn't been passed upon by the court and would have to be passed upon by the court probably before it could be settled one way or the other, that is, the question of this injunction which had eliminated Federal action for the moment and left the territory without action of any kind and that the states had taken action with respect to that territory on the theory that the Federal action was absent.

It all comes as an interpretation of whether Federal power having been exerted at all, that eliminates all state action, or whether the Federal power having been exerted, having covered the whole field,

they step in and cover the balance of the field. The legality of that procedure no one but the court can decide.

DR. C. J. DRAKE: There is another question in the present quarantine, regulation 4. There exception is made between the period of June 1 and December 31.

MR. L. H. WORTHLEY: That applies to New England.

DR. C. J. DRAKE: It wouldn't apply to packing in the case of oat straw and the like in the Great Lakes region?

MR. L. H. WORTHLEY: No.

CHAIRMAN S. B. FRACKER: In connection with Dr. Drake's first question, I would suggest that Mr. Worthley outline for us the specific areas in various parts of the United States that are now known to have the European corn borer in them which are not covered in the last amendment. There probably have been some infestations found outside since the board acted.

MR. L. H. WORTHLEY: Other than these which have been mentioned by Dr. Drake, I believe there has been one corn borer found in Illinois, that is in the last week or so. That is right on the Indiana line, I should say about fifty miles south of Chicago.

CHAIRMAN S. B. FRACKER: Then there is one infestation in Illinois and one in Berrien County, Michigan.

MR. L. H. WORTHLEY: Jersey City and Bayonne, Staten Island, Brooklyn, the townships of Hempstead, Bridgeport, and Milford, and three townships near, New London, Groton and Stonington.

CHAIRMAN S. B. FRACKER: In the case of Long Island, is the entire section infested and is the same true of Brooklyn?

MR. L. H. WORTHLEY: Hempstead comes in Nassau County. The Brooklyn infestation is in Queens.

DR. E. N. CORY: I would like to ask Mr. Worthley whether any effort has been made to clean up Bayonne and the tributaries of the Susquehanna River?

MR. L. H. WORTHLEY: Scouting work is being done there now, not scouting work exactly but all river bottom where infestation occurs is now being patrolled by inspectors in an endeavor to get an early clean-up before we get high water. This year, however, we had high water unexpectedly before we got at it. Another season we will try to get at it earlier and see that it is done before there is a possibility, but every river running out of the infested area is being worked on and about one-half of them are completed at the present time.

DR. C. L. MARLATT: I don't want to take any one side in this matter of including the total territory in the quarantine, that is a matter of judgment for the men in charge of the work in the states. In fact, it is a subject which we are not at all adverse to advice upon, but I simply want to call attenton now to the fact that this isn't a new thing. The gipsy moth, for example, has made several outbreaks in states other than in New England.

Several times it has established itself in the state of New York. It has been established for many years in New Jersey. In New York and Ohio, immediate and drastic control work was undertaken. So far as we know, and we have no reason to think otherwise after all these years, these outbreaks were cleaned up.

As I understand it, we have released from quarantine the entire control belt along the Hudson River, from Champlain southward, but it is being released because we have determined to keep it clean, and Mr. Burgess believes he has kept it clean, so that certification of movement of products from that territory has been discontinued, based on the clean-up and the thorough scouting.

These are all on the same basis and illustrate the same principle, as I understand it, which is being followed by Mr. Worthley with the corn borer. Whether that is a good basis or not is a question that is open to debate, but the thing isn't new, it isn't novel, there is plenty of precedent for it. The only question is, and it certainly is very pertinent to know, whether there is any movement this year which leads to a danger of such a nature as to warrant the exclusion of these areas from the quarantine.

DR. A. F. BURGESS: Since the gipsy moth has been mentioned, I just want to say a word in regard to outside counties. Where you have an infested area, the theory of most quarantines has been to permit free movement of materials within that area. If you succeed in cleaning up a portion of the infestation, as for instance a town on the edge of a quarantined district where a single infestation is found, and where continuous work carried on over a period of several years reveals no further infestation, it is safer to eliminate this district from the quarantined area than to permit it to remain inside where there is always danger of reinfestation.

That is the principle that has been followed in connection with the gipsy moth control, and I think that the same principle is true in connection with these points in Connecticut, where Mr. Worthley has been carrying on his clean-up work, and which have been under practically constant observation.

I think it is only fair to say that you can't put on a quarantine and make it absolutely bullet proof. If you do that, you will tie up everything. There are ways that that material will be smuggled out that are almost impossible to foresee.

I think if the quarantine is laid out on the basis of what is fair and what is reasonable, that will accomplish the object. It doesn't make so much difference whether every town where a single insect is found is put under quarantine or not. Mr. Marlatt said Cleveland was never put under quarantine. There was a small colony of gipsy moth found down there. Intensive work was done. We knew where all shipments were going and there wasn't a necessity for quarantine. The place was cleaned up. In New York, that area has been under state quarantine ever since the infestation was found. The conditions in New York state have been much the same as in Cleveland. We had an infestation in Geneva, New York, at one time. Geneva wasn't put under quarantine, but such intensive work was done there that there was no opportunity for spread from that locality.

I think the main thing is to accomplish the purpose and that is to prevent the spread. If you can do it without putting on a quarantine, you are so much better off.

DR. WILMON NEWELL: Mr. Chairman, I would like to have interpreted the proposal of that corn borer committee discussed by Mr. Marlatt. So far as the farmer doing extra work in connection with the corn borer, that is new in our history of applied entomology. It is admitted that is not to be an attempt at reimbursement. All arguments that have been accepted in eradication work would not apply here. When the proposal is shown with all its trimmings, it is simply a proposal to pay the farmers for applying some control measures to an injurious insect.

It seems to me it will be a very happy day for the farmers of this country when Congress establishes a precedent of that kind by appropriating money for that purpose.

Dr. Marlatt explained in detail the ideas of the corn borer committee in reference to the control measures to be employed if the bill which they had framed for the appropriation of $10,000,000 was passed by Congress.

He made it plain that the campaign proposed was not his idea and that his only connection with it was the drawing up of the bill which was merely a clerical matter which he was asked to perform because of his familiarity with the wording of such a document. He also empha-

sized that he was not defending the measure before the meeting but was explaining and discussing it to obtain the suggestions and opinions of quarantine men from the various states.

He explained that the basis for the intervention of state and Federal authority and the expenditure of state and Federal money is the fact that we are dealing with a pest that is not wide spread and generally distributed. We are attempting a degree of eradication, to prevent spread to new territory.

The farmers within the territory where the clean-up campaign is to be carried on will be reimbursed for work which they do in addition to what is usually done in ordinary farm practice. This will amount to about $2.00 per acre, which is thought to be fair and just, as they are not suffering any loss from the insect at the present time, and the additional work is not only for their own protection, but for the protection of the great corn belt beyond them.

He pointed out that the state governments will have to provide the law and authority, and will have to be responsible for the police control and enforcement of the clean-up work, while the Federal Government will help to provide the funds.

There is nothing new about carrying on a project of this kind, and the establishing of a precedent by using government funds in this manner need not be considered as it has been done on numerous occasions. The pink boll worm was eradicated from a large area in east central Texas and farmers as well as others were employed to do the work and were reimbursed for what they did.

Mr. Newell said he was not opposed to the experiment being made if it aimed at 100 per cent perfection in eradication. He was opposed however, to the government paying the cost of doing the work.

Mr. Wallace agreed with Dr. Newell, and thought that the expense of doing this work should be borne by the farmers alone. He stated that in Indiana he had organized the clean-up work on this basis and was opposed to the government carrying the expense, as it was not in line with what he had told the farmers in his state. The organization of the work had so far been carried on by three men, but he expected later to have 15 men in the field to carry it to completion.

CHAIRMAN S. B. FRACKER: I was hoping there would be a rather more general expression of opinion with respect to including some of the infested sections which are not now included in the area. The Wisconsin committee has already passed on its opinion that all of the infested district should be included within the quarantine district.

Dr. Drake speaking for Iowa has expressed the same point of view. Dr. Marlatt has suggested that the board would appreciate the suggestions of others here on that same matter as to the feeling of the different states.

Is there any further discussion of that principle? If not, we will conclude the European corn borer discussion.

The original suggestion regarding this was that a number of other Federal quarantines be taken up, including the gipsy moth and the pink boll worm. What is the pleasure of this body.

MR. P. A. GLENN: I move we adjourn.

The motion was seconded and carried and the meeting adjourned at four-fifty o'clock.

Section of Apiculture

Wednesday Afternoon, December 29, 1926

The first session of the Section of Apiculture of the American Association of Economic Entomologists, held in Logan Hall, University of Pennsylvania, Philadelphia, Pennsylvania, December 29, 1926, convened at two o'clock, Mr. J. I. Hambleton presiding.

CHAIRMAN J. I. HAMBLETON: The first paper on the program seems to be the Chairman's address. I will call on Dr. Phillips to preside.

. . . Dr. E. F. Phillips assumed the chair. . .

CHAIRMAN E. F. PHILLIPS: The first item on our program this afternoon will be the address of the Chairman of the Section, Mr. Hambleton.

THE NEED OF A NATIONAL BEEKEEPERS ORGANIZATION

BY JAS. I. HAMBLETON, *Apiculturist, Bureau of Entomology, United States Department of Agriculture*

ABSTRACT

A national beekeepers' organization is necessary because today the industry in this country has no head and no center of activity. There is no one guiding power to direct cooperation, and no council to give advice. All worth-while efforts being made at present are individual and as such largely lose their power.

Owing mostly to the nature of the Apicultural Section, most of us present are interested in beekeeping largely from the professional side. Our membership includes apicultural teachers, regulatory officers, and research workers, with a scattering of commercial producers and others who have won some distinction in the great field of beekeeping.

Most of us, therefore, are highly interested in State and Federal appropriations, since our work is to a great extent dependent upon the amounts and restrictions of funds derived from such sources. Since the meeting of this Section offers practically the only occasion for a gathering of a large number of men professionally engaged in beekeeping, I welcome this opportunity to say a few words about certain financial aspects of our work.

In many cases State and university beekeeping officials are to be credited with what has been accomplished in the formation and leadership of beekeepers' organizations. It is also true that they have had to depend largely upon their own efforts to procure appropriations for conducting their respective offices or laboratories. Today such methods seem essential if the work is to continue and any advance is to be made. It is true, however, that such conditions are not ideal, and there is no questioning of the fact that the efficiency of the work in hand is lowered when a teacher, regulatory officer, or investigator, has to spend a considerable part of his time and thought in obtaining funds with which to run his department.

This state of affairs should be remedied, but to remedy it will for some time necessitate further attention to matters other than those pertaining directly to the respective offices in question. There is no doubt that State and Federal work is poorly supported. More research, more teaching, and more extension and regulatory work should be done. I feel that we have just about reached the limit in what can be done along these lines without stronger backing from the beekeepers themselves.

On the other hand, it sometimes appears that State and Federal work is *too* well supported; that the work being done or attempted is appreciated only by a small minority of our beekeepers. Several Government agencies are trying to help the beekeepers, and could do a great deal more for them if government work received better appreciation and support from those most benefited. The same applies in much of the work in many of our States; were it not for individual efforts on the part of State men little or nothing would be accomplished. In several cases it is evident that beekeepers are being trained to ask for what they want, or are being awakened to the fact that they can exert some influence if they go about it in the proper manner. After a certain amount of such guardianship they should be able to steer their own ships in safe and productive channels.

To equip the beekeepers of this country with their own ships, having an admiral in supreme command, is an ideal to look forward to, and an object worthy of attainment. So important is this that I feel that without some such organization beekeeping will never reach anywhere near its maximum development as a respected and profitable business. In spite of whatever prodigious efforts may be made by an individual State, it will never realize its ideal by working alone. Each State must contribute a share to the common pot from which the industry as a whole will receive its nourishment.

An individual State may perfect a marketing organization; it may have an ideal apiary inspection service; other worth-while services may be rendered to the beekeepers. The State may have all the agencies necessary to look after teaching, research, marketing, and inspection, and may in other ways be a kingdom to itself. Such a plan is highly commendable, and every State would do well to follow some such course. However, I feel that no State, whatever it may do for itself, will ever attain its objective without the backing of a strong national organization. It may carry on for a time, if sufficient interest and fever heat can be maintained. Those who have had much experience in beekeepers' organizations know how difficult it is to maintain for a very long time the fast pace essential for holding them together.

A national organization is necessary to act as a balance wheel for the work of the various States. It must absorb some of the surplus energy being thrown off now by this State, now by that, and supply to other States the necessary momentum to keep them going on a sane and safe track.

Through these many years the industry has survived. It has made considerable progress. A great impetus was given to beekeeping at the beginning of the World War, and during that period it was beyond question a profitable industry. After the war its status changed considerably; it soon settled back to its pre-war basis, and today is no better off than it was before the war. Advantage was not taken of the boost received when beekeepers were highly interested in their work and in each other.

Today the industry in this country has no head, and no center of activity. There is no guiding hand which can direct cooperation and no council which can give advice. All worth-while efforts being made are individual, and as such largely lose their power. Advantage should have been taken of the interest displayed during the war and immediately after it, and an effort made to hold the industry together and mold it into a unit.

Much effort is being wasted. Beekeepers from one State are wrangling with those of another because of quarantines and differences in inspection laws. Merely because of petty jealousies objections are being made to the expenditure of Federal funds. If such behavior is tolerated, future apicultural activities by the Government will be jeopardized. These activities should be directed into useful channels. Marketing conditions are bad, but no united effort is being made to correct them. Individual States are attempting to remedy conditions, but no two States are working together for the same specific purpose.

We have no reliable statistics on beekeeping; we do not know where our crops are being produced or where our products are going. We are trying to run an industry without accounts or books of any kind. Beekeepers apparently are not worried over this situation; as a matter of fact, in some cases they actually oppose giving information pertaining to their business. In one instance which has come to my knowledge, one of the Department crop reporters, wishing to gather as complete data as possible, singled out a State Association as his source for reporters on beekeeping data, but received absolutely no cooperation. Is it any wonder that with such a display of apathy we make no progress?

We are spending about $100,000.00 annually in the various States in trying to eradicate or control bee diseases, and are proposing that still greater funds be diverted for this purpose. On the other hand, the States are spending probably less than one-half of this amount on all the other apicultural problems put together. These include research on bee diseases, wintering, which alone takes annually a toll of more than ten per cent of all colonies, and every other problem with which the beekeeper's profit is concerned. This does not appear like an equitable expenditure of funds. It is not difficult to imagine what would come to pass if no attempts were made to control bee diseases; disease control I mention specifically, not because I think too much money is being used for this particular project, but that not enough thought and enough money are being diverted towards the solution of our many other problems.

We have drifted into this state of affairs without realizing the true perspective of things. Various States are carrying projects of one sort or another pertaining to beekeeping research and, strangely enough, most of the State projects do not pertain to conditions restricted to the State in which they are being carried on. Most of the problems are of general application and, if we had some agency which could correlate such work and divide the problems among the various investigators, more progress could undoubtedly be made.

To equip the beekeepers of this country with their own ships, having an admiral in supreme command, is an ideal to look forward to, and an object worthy of attainment. So important is this that I feel that without some such organization beekeeping will never reach anywhere near its maximum development as a respected and profitable business. In spite of whatever prodigious efforts may be made by an individual State, it will never realize its ideal by working alone. Each State must contribute a share to the common pot from which the industry as a whole will receive its nourishment.

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Funds have been made available by the Government from time to time for expenditure in the States for agricultural purposes. Only recently the Purnell Act funds were made available; but only two States, so far as I am aware, requested money from this source for beekeeping projects. In a recently published list of 133 projects in home economics, being carried out in our State experiment stations, not a single one related to honey.

Enough instances have been cited to show that the beekeepers of this country have many problems in common and that there are innumerable tasks to be performed which cannot be taken over by any one individual or any one State.

The beekeeping industry is at present handicapped by many unsatisfactory conditions for the betterment of which we do not have sufficient knowledge. More research and study are needed before we can even think of attacking some of our problems. It would nevertheless, be folly to wait until all conditions are propitious before trying to help ourselves. Would it not be better to apply the knowledge we have, for such good as it may do and at the same time systematize and properly relate the elements of the industry so that when new facts are available use can be made of them?

Research cannot progress satisfactorily, whether it deals strictly with scientific or with marketing problems, without being strongly supported by those whom it benefits. In the present state of disorganization beekeepers are not waging a concerted campaign to better their marketing conditions; nor do they seem deeply interested in the solution of many of their other problems, which can be brought about only by extensive research. Perhaps the reason for this is nothing more than neglect. The average beekeeper is so intensely engrossed with his bees that he forgets everything else. In many cases he even forgets to market his crop until he feels the pinch for money, and then generally lets his honey go at the buyer's price.

As I have tried to urge, what is needed is an agency, such as a strong national organization, to guide or to lead. Beekeepers have recently shown what they could do in the fight against the Cole bill, and they can do many more worth-while things by banding together. The impression which I wish to leave in closing is that it behooves every one of us to give attention and thought to beekeepers' organizations, and particularly to a national organization. I sometimes feel that we are working on a very infirm foundation, and that to build a useful superstructure it will be necessary for us to climb down occasionally and do

some work on that foundation. In this connection I hesitate to mention the name of our only existing national organization. It is quite evident that it has not made a big impression on American beekeeping during its existence. For one thing, its constitution is faulty. Something is wrong; and I would suggest that we find out what the trouble is and put our efforts into the construction, or reconstruction, of a truly national beekeepers' organization.

CHAIRMAN E. F. PHILLIPS: I am sure you all feel as I do that we could profitably spend the remainder of the afternoon session discussing the paper which has just been read. There is no need whatever in hiding the fact that the only existing organization, the American Honey Producers League, has been in existence so many years that we can scarcely count them. It has perpetuated by reelecting officers and calling meetings year by year and it has seemingly been the fear of beekeepers everywhere to acknowledge the thing died almost before it was born. So in presenting that subject before us this afternoon Mr. Hambleton has brought up something of very vital interest.

...Mr. J. I. Hambleton resumed the chair...

CHAIRMAN J. I. HAMBLETON: The next paper on the program is by W. J. Nolan.

DO DAILY EGG-LAYING RATES OF LESS THAN 3,000 FOUND BY RECENT INVESTIGATORS INDICATE AVERAGE QUEENBEES?

BY W. J. NOLAN, *Associate Apiculturist, Bureau of Entomology, United States Department of Agriculture*

ABSTRACT

A daily gain of 20 to 25 pounds of honey during a honey-flow is considered high for any colony of honeybees. Scientific data as to average nectar loads, number of trips per day, and the amount of water eliminated from nectar after it is brought into the hive indicate that a queenbee having an average daily egg-laying rate of less than 3,000 can produce enough workers to gather an excess of 25 pounds of nectar during any one day. Consequently, recent scientific brood-rearing investigations were made on colonies having average queenbees, even though none of the latter were found to lay over 3,000 eggs in twenty-four hours.

The past thirty-five years have been marked by attempts in various parts of the world to trace out scientifically the normal brood-rearing activity of a colony of honeybees throughout an entire season. Investigators who have been thus engaged, listed chronologically together with the countries in which they worked, are Ph. J. Baldensperger, in

Palestine and southeastern France; Leon Dufour, in northern France; Dr. K. Brünnich, in Switzerland; Dr. L.R. Watson, followed by the writer at the Bee Culture Laboratory of the Bureau of Entomology; Dr. J. H. Merrill, in Kansas; C. B. Gooderham, in Canada; L. R. Hughes in Argentina; and Dr. F. A. Tunin, at the Tula Apicultural Experiment Station in Russia.

The data published by these various investigators have one striking feature in common—in no instance is any evidence offered which would seem to prove that any of the queens investigated attained a daily egg-laying average in excess of 3,000 eggs per day over any 21-day period. Even a daily egg-laying average of 2,000 would fit most of the cases presented. This is quite contrary to what might have been expected, in view of the fact that on more than one occasion statements have appeared in beekeeping literature which would lead to the belief that all exceptionally good honey crops are necessarily prefaced by some high egg-laying rate. "High," in most such instances, has been 3,500 eggs per day or more.

One judging superficially the work of the investigators named might be tempted to say that poor honey-flow conditions explain why lower rates were obtained than those so often given in textbooks. When the localities in which the various investigators worked are listed geographically, however, it is readily seen that nine different localities in seven different countries on four different continents are represented. If soil or honey-flow conditions are the all-important factors in the case, the wide geographical distribution of the places where these investigations have been conducted would seem to have offered a sufficient range of such conditions for them to have caused a corresponding variation in the results.

The relative size of a honey crop obtained by two colonies, each in a different locality, is not a safe index of the relative population or number of field bees in each colony, inasmuch as the number of days during which nectar is available in the field varies greatly in different regions. The maximum daily gain, however, does furnish such an index. Many beekeepers in apparently good beekeeping regions would be satisfied if they could obtain an average of from 5 to 10 pounds of honey a day throughout their main honey-flow. In the Dakotas and western Canada, regions with a large number of days when nectar is available and the regions to which we are now accustomed to look for stories of big honey crops, we find that a daily gain of 20 to 25 pounds is considered high. Such a gain has not yet been authentically reported for any large number

of successive days, however. On studying the daily gains at the various stations at which brood-rearing investigations have been conducted, we find that some of them, at least, compare rather favorably with those reported from the Dakotas and western Canada. At the Bee Culture Laboratory a daily gain of 19 pounds has been obtained, and a daily gain of about 18 pounds has been reported at the Tula Apicultural Experiment Station in Russia. Mr. Gooderham has reported a daily gain slightly in excess of 15 pounds at the apiary in Canada in which his experiments were conducted. Doctor Merrill reported that one of the colonies on which he worked in Kansas in 1924 stored 159 7/8 pounds of honey between June 10 and August 31, the highest daily gain having been 10 pounds. Mr. Baldensperger's locality yielded sufficient nectar for him to make a living from his bees. It is quite evident that such results would not have been obtained from colonies whose development had been retarded by want of stores during the time of building up; an undersized colony could not collect so much honey on any one day. In this connection it may be well to bear in mind that the average annual production per colony for the entire United States since 1913, as reported by the Bureau of Agricultural Economics of the United States Department of Agriculture, is below 50 pounds per colony.

It is possible to examine these brood-rearing results in the light of scientific data now on hand relating to various other factors which affect the honey flow, and thus to determine whether an average daily egg-laying rate of less than 3,000 will produce enough field bees to gather a satisfactory quantity of honey daily. These other factors include the average amount of nectar brought in per field bee per trip, to be designated in this article as *a;* the average number of trips per field bee per day of average length, to be designated as *b;* the number of field bees, to be designated as *c;* and the proportional part of the original weight remaining after the nectar carried in has undergone any process of water elimination, to be designated as *d*. Now the daily gain in *honey* for any colony is evidently equal to these four factors multiplied together. In short, using the symbols given above,

$$abcd = \text{daily gain in } honey$$

It remains for us to make substitutions in the foregoing formula to determine what average egg-laying rate will give a satisfactory daily gain. Quite evidently the unknown quantity in this case is involved in *c*, which represents the number of field bees. It has been widely held that the average life of worker bees in a normal colony during the height

of the active season is only six weeks, and that the first three weeks of this time are devoted to hive duties and the last three to field duties. It should be emphasized that these figures are averages, and individual exceptions may occur in either direction. Some writers have maintained that the length of life during the most active season is only five weeks, but this is offset by the fact that others hold that the worker begins its field duties at the end of the second week. Some even maintain that the average life of the worker during the active season is longer than six weeks. In any event, it seems that a period of field duties averaging three weeks satisfies the results obtained by most investigators, whether the length of life is taken as five or six weeks. This means that the minimum field force on any one day during the most active part of the season may be considered as equaling the number of emergences during the three-week period immediately preceding the average period spent in hive duties. The rate of emergence for any particular period is, in turn, equivalent to the *effective egg-laying rate*[1] during the corresponding period three weeks earlier. In healthy colonies under normal conditions the effective egg-laying rate is practically equivalent to the egg-laying rate determined from counts of sealed brood, with the possible exception of the extreme ends of the season. The effective egg-laying rate will be designated here by x. Bearing in mind the time which elapses after an egg is laid until the resulting adult bee takes up field duties, the number of bees in the field force may be found by the equation

$$c = 21\,x$$

Since the daily gain in honey is expressed in weight, it is necessary to express the number of field bees in like terms. In this country it has been quite commonly accepted that there are 5,000 bees to the pound, although variations have been reported in either direction. Hence, in substituting for c in the formula for the daily gain, not $21\,x$, but $\frac{21\,x}{500}$ is to be used.

In substituting for a, the average nectar load carried by worker bees, a wide range is afforded by data at present on record. Doctor Merrill, of Kansas, in 1922, Professor Lazenby, of Ohio State University, in 1899,

[1]The "effective egg-laying rate" was defined by the writer in an article "Colony Population and Honey Crops," appearing in *Gleanings in Bee Culture*, volume 53, pp. 366–368; pp. 443–446, as follows: "The egg-laying rate which represents only those eggs resulting finally in additions to a colony's population may be termed the effective egg-laying rate, in distinction from the actual egg-laying rate, which includes all the eggs laid. This rate for any day or period, of course, is identical with the rate of emergence for the corresponding day or period three weeks later."

and Professor Koons, of Connecticut, in 1895, presented data which show that the average loads carried by bees investigated by them were equivalent to one-quarter of the average weight of a worker bee. Doctor Park, of Iowa, in 1922, however, as well as Professor Gillette, of the Colorado Experiment Station, in 1897, and Mr. Demuth, in unpublished work done while with the Bee Culture Laboratory of the Bureau of Entomology, have shown that the average load is equal to one-half of the average weight of worker bees. Doctor Park found, furthermore, that the maximum carrying capacity is 85 per cent of the worker's weight, and Professor Gillette found bees in emerging swarms carrying practically their own weight in honey. Mr. Demuth also found bees carrying their own weight in honey when robbing. Doctor Merrill, however, did not find the maximum carrying capacity much greater than the average carrying capacity; but Professor Koons found it to be equal to about one-half of a bee's own weight, and Professor Lazenby found it to be slightly in excess of one-half of a bee's own weight. For the purpose of this paper, the minimum average figure found by any of these investigators, one-quarter, will be substituted for a in the formula for daily gain.

The question of the average number of daily trips which a bee makes during a good honey flow is likewise a subject on which we may find varying opinions. Doctor Park has reported that in 1920 he found bees making an average number of 13 ⅓ trips per day, whereas in 1921 a season with a poorer honey-flow, the average number dropped to 7 trips per day. In 1920 the maximum number of trips per day found by him was 24; in 1921 it was 17. Certain investigations carried on by the writer, as well as results given in the works of others, lead to the conviction that Doctor Park's average figures are not excessive. In fact, they are far below what have been reported by certain other investigators. Thus, Hommell in his book reports that Astor had observed a certain marked bee which made 110 trips per day to a feeder on two successive days, while Demeure observed a marked bee which made 60 trips in one day. For the purpose of this paper it seems quite conservative to use 10 trips per day as the value to be substituted for b. In case the average number of trips is really greater, the effective egg-laying rate could be reduced proportionately.

We now come to the last substitution to be made on the left-hand side of the equation, namely, the fractional part left after the nectar which has been gathered by the bees undergoes any elimination of its water content. Although nectar has been found to vary much in its water

content, and although apparently it has often been supposed that all loss of this water takes place by evaporation in the hive, yet certain investigators, including among them Brünnich, maintain that a portion of the water is already lost between the time when the bee gathers the nectar and when it deposits the nectar in the cell. At any rate, all scientific investigations along this line point to the fact that during a good honey flow any loss in weight which occurs as a result of the elimination of water content in nectar after it is deposited in the hive is only about 25 per cent, or less. This result has been shown most recently by Jas. I. Hambleton. Dufour Maujean, and other earlier workers likewise obtained the same result. It is well known that nectar in certain of our western regions loses far less than 25 per cent in weight after it comes into the hive, but for the purposes of this article we shall consider that only ¾ of the weight carried into the hive by the bees during the nectar flow is left as honey. This is the value then to be substituted for *d*.

In order to have a daily gain which will be far higher than is usually found in most localities throughout the entire world, we shall consider that the average gain in twenty-four hours is 20 pounds of honey. This is equivalent to about 27 pounds of fresh nectar, assuming that as high as ¼ of its original weight will be lost by the elimination of water after it is in the hive. Substituting 20 pounds on the right-hand side of the formula for daily gain, as well as the values given previously for *a*, *b*. *c*, and *d*, the equation becomes

$$\tfrac{1}{4} \times 10 \times \frac{21\,x}{5000} \times \tfrac{3}{4} = 20$$

Solving for *x*, the average daily effective egg-laying rate necessary to meet the values given for nectar loads, number of daily trips, number of field bees, and amount of daily gain, it is found to be 2,540. This theoretical effective egg-laying rate is at once seen to be quite in line with that obtained empirically by the various investigators named earlier in this paper. If we assume the maximum number of trips per day found by Park, this egg-laying rate would be cut in two, or else the amount of honey obtained would be doubled. If we assume the lower rate of evaporation found in certain of our western regions the egg-laying rate would likewise be lowered, or else the amount of honey brought in per day would be greatly increased. The same holds true if we use only the average nectar loads found by Park, Demuth and Gillette, to say nothing of using the maximum loads found by these investigators. In this connection it must be remembered that bumper crops are only

obtained under optimum conditions, whereas in solving this problem the maximum figures obtained by various investigators have not been used. The use of these maximum values, however, would surely indicate that the egg-laying rate obtained by this formula is too high or else we have never yet obtained the maximum crop of which present day colonies are capable. Needless to say optimum conditions in all respects are not to be expected often in commercial beekeeping.

The results of present day investigations on brood-rearing, therefore, judged by scientific data on other factors determining the honey-flow as given here, indicate that a colony whose queen lays even less than 3,000 eggs per day on an average over a sufficiently protracted period at the proper time is capable of producing an exceptionally large honey crop. If we attempt to reconcile these results with the statements so long current in text books which would lead one to suspect that the average daily egg-laying rate of an ordinary queen is much higher, leaving out any question as to the accuracy of the observations, one is led to conclude that either (a) the basis for all such statements as to the high egg-laying averages were only sporadic occurrences, or else (b) that in these later years queenbreeders have lost sight of prolificness as a quality of any great importance in their queens if they have made any attempts at selective breeding. It would appear, then, that one of the direct benefits which beekeepers in the future may derive from the artificial fertilization of queenbees is the obtaining of more prolific strains of bees than are generally met with at the present time, in short, the production of queenbees whose egg-laying rates will average in excess of 3,000 per day at the proper time of the year.

CHAIRMAN J. I. HAMBLETON: Is there any discussion on this paper? I believe Mr. Nolan has made one point clear, that a great many beekeepers and queen breeders do not like to admit that their queens can't make an average daily laying of over 3,000 eggs per day, but Mr. Nolan has certainly shown that a queen that is only laying 2,500 eggs per day can bring in 20 pounds per day without working herself unduly.

CHAIRMAN J. I. HAMBLETON: We have Mr. Sechrist's paper on "Honey Grading."

HONEY GRADING

By E. L. Sechrist, *Associate Apiculturist, Bureau of Entomology, United States Department of Apiculture*

Commercial beekeeping in the United States has undergone a great development during recent years. Many a beekeeper now devotes all his energies to honey production, managing hundreds or thousands of hives of bees and producing tons or carloads of honey yearly. The production of such large quantities of honey in regions where only a small proportion of it can be consumed locally demands the development of larger markets in the great consuming centers—the large cities.

To handle such wholesale markets satisfactorily, including a developing foreign market which now takes more than five million pounds of honey annually, honey, as in the case of all food products, must be marketed according to uniform standards. Realizing this, the Bee Culture Laboratory of the Bureau of Entomology, in cooperation with the Bureau of Agricultural Economics, has established standard Federal grades and grading rules for both comb and extracted honey. Earlier attempts at making grading rules have usually approached the subject almost wholly from the standpoint of the honey producer, leaving out of consideration the demands of the consumer of honey, but, as the consumer is the court of last resort, it is necessary that his desires and the requirements of the dealer in honey be considered, as well as the wishes of the beekeepers themselves.

The effect of proper grading upon the American public and thus upon the market for honey is the most important thing to be expected from uniform Federal grading rules. The use of Federal grades will give a general confidence now lacking in the purity and quality of honey; a confidence which must be secured before honey can become a staple food product. If confidence in the good quality of honey marketed under Federal grades leads to even a moderate consumption of this product by a majority of the households in the United States, as may reasonably be expected, a greatly increased market for it will be secured and the status of beekeeping in the United States will improve accordingly.

The accurate color grading of honey has been made possible, after several years of experimental work, by the development of a color grader whose operating principle is the comparison of a wedge of glass of the proper color with an opposed wedge-shaped trough containing the sample of honey to be tested. When the honey and the glass, viewed through a narrow slot, exactly match in tint, a pointer on an

appropriately divided scale indicates the color grade into which each sample falls. Department Circular No. 364, on the development and use of the extracted honey grader, has been published, but will soon be superseded by a new circular covering the grading of both comb and extracted honey.

Clearness, density, and flavor are other points, in addition to color, on which the grades for extracted honey are based.

Although the grading of extracted honey is comparatively simple, the numerous points on which comb honey must be graded make the problem a complex one. Not only must the quality and the color of the honey be considered, as with extracted honey, but also the appearance of the comb and of the wooden section in which the square of comb is built. This general appearance, or finish, includes the color of the wax, the smoothness and completeness of the capping, and any staining of the surface of the comb by propolis or in any other way. As comb honey is very fragile, the attachment of the comb to the wood must be such that the honey will endure without breakage, the rough treatment to which it is subjected in shipping. As an increasing amount of comb honey is going into export trade, the requirements for overseas shipping must also be considered.

In addition to the requirements for quality of honey, finish of comb, and attachment to the wood, comb honey is also graded as to its net weight.

As though the conditions were not yet sufficiently complex, the requirements for Federal grades must be such that all commercial honeys from all parts of the United States, from whatever floral source, and often varying markedly in appearance, may come within the requirements of the rules.

While the Federal grading rules are only advisory, it is expected that they will be adopted by the several States, working in harmony, since there are many requests for uniform standards of grading.

In the future, instead of merely producing a crop of honey and then grading it into Fancy and No. 1 to suit the crop he has produced, it will be necessary for the commercial beekeeper to plan his system of management so that he can produce the largest proportion of honey that will meet the requirements of the Federal grades for Fancy and No. 1 honeys, if he is to receive the greatest possible income from his beekeeping. If a sufficient output of such standard grades is produced the public will be able to buy, as a staple, such honey as the housekeepers desire to use on their tables.

CHAIRMAN J. I. HAMBLETON: We also have Mr. Park's paper on "Studies on the Evaporation of Nectar."

STUDIES ON THE EVAPORATION OF NECTAR[1]

By O. W. PARK, *Iowa Experiment Station, Ames, Iowa.*

ABSTRACT

Results of recent experiments by the author indicate that no concentration of nectar occurs within the body of the bee between the flower and the hive entrance, but that evaporation in its several phases, carried on within the hive is sufficient to account fully for the observed rate of nectar concentration.

The two theories that have been offered in explanation of how the honeybee reduces the high water content of nectar to the low water content of honey, are known as the *excretion* and the *evaporation* theories. The first of these is based largely upon the well known observation that bees carrying thin nectar or thin syrup often eject a tiny spray of colorless liquid. As early as 1878, Rauschenfels (1) and others assumed that this was the result of a process within the body of the bee whereby some of the excess water was eliminated from the nectar while the bee was enroute to the hive.

De Planta (2), at about the same time, arrived at a similar conclusion from the results he obtained from the analysis of nectar, new honey and old honey, in which he found that honey newly deposited in the cells reached them already considerably concentrated.

Thompson (3) and A. I. Root (4) collected and tasted some of this spray. Both reported it to be tasteless and as far as they could tell was only water.

THE EXCRETION THEORY

Brünnich (5, 6, 7) has developed an interesting theory in which he states that the membranous wall of the honey-sac allows water to pass thru it into the blood of the bee, from whence it is removed by the rectal glands and discharged by them into the rectum.

If the excretion theory is valid, an analysis of the nectar taken from the honey-sac of a bee entering the hive with its load should show a greater concentration of sugar than would nectar taken directly from the plants from which the bee obtained its load. A number of analyses of this character were made during the past summer on nectar from two

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[1]The writer desires to express his sincere appreciation of the hearty cooperation given by the Department of Chemistry of Iowa State College. Special thanks are due Dr. R. M. Hixon, Plant Chemist, for his valuable assistance and guidance in the analysis of nectar.

different sources. Analyses were run in duplicate in practically all cases in order to guard against errors.

The first plant used was the common milkweed (*Asclepias syriaca*). Analyses were made of eight samples of nectar taken directly from the flowers and seven from the honey-sac contents of milkweed nectar-carriers caught as they were entering the hive. These analyses showed decisively that the nectar taken from the honey-sac of the returning field-bee was not more concentrated than that taken directly from the flowers. As a matter of fact, the average found for the concentration of sugar in the nectar taken from the bees was eight per cent lower than that for the nectar taken directly from the flowers. This decrease in concentration appeared as a rather constant factor and in only one case did the honey-sac contents show a higher concentration than the average for nectar from the flowers themselves. One such exception is not more than should be expected in an experiment of this nature in which the bees caught at the hive may have secured their loads from a group of milkweed plants other than that from which the nectar was gathered by the experimenter.

The second source of nectar used in these experiments was the gladiolus (*Gladiolus* sp.). This plant yielded nectar in quantities that could be collected and fed to the bees, thus eliminating the factor suggested in the preceding paragraph as a possible source of error. Field-going bees were used. Each bee was marked, placed in a queen-nursery cage, and kept there without food for an hour. A single large drop of nectar was then placed on the screen of each cage. Only those bees which took up a large drop were used further, thus insuring that every bee used had a full load of the nectar provided for it, and that it had none from other sources. These bees were then released at a distance of one-half mile from the hive and were captured when they returned to the hive. The nectar was then recovered after having remained within their honey-sacs for approximately one hour. Analyses were run on the nectar recovered from the bees, as well as upon a sample of the nectar as it was obtained from the flowers.

The following day, the experiment was repeated, only in this case a harmless coloring material was added to the nectar before it was fed to the bees, so that not only were the bees marked but the nectar itself was marked also. Hence it would have been impossible for one of those bees to get rid of the load it was given and acquire another from a different source before returning to the hive, without being detected. The nectar was analyzed both before and after the coloring was added,

and again after it was recovered from the bees. The results of this experiment were almost identical with those obtained the previous day when uncolored nectar was used. In both of these cases the concentration of sugar was about one per cent less in the nectar taken from the bees than it was before being fed to them.

Several questions arise. Why was the decrease in concentration so much greater in the case of milkweed nectar than in the case of gladiolus nectar? As suggested above, the bees caught at the hive might have been working on a group of plants other than that from which the experimenter collected his sample. It is possible also that some few of the bees used may have carried loads from plants other than milkweed, although every one of the bees used bore the pollinia of the, milkweed, clipped onto her feet and legs. The writer's earlier researches on the habits of field-bees (8) indicated that a bee seldom changed from one kind of flower to another in her gathering until her particular kind was no longer available. It is unlikely, then, that this factor would enter in until towards the end of the blooming period, but the analyses showed marked uniformity throughout the whole period.

Another possible cause of this difference in results from the two different sources is the fact that in the case of the gladiolus, the nectar was quickly obtained by the operator in considerable quantities whereas, in the case of the milkweed, the process of collecting a sample from the flowers was very much slower, and smaller quantities were obtained, so that there was greater aeration of the milkweed nectar. A loss of water by evaporation would tend to increase the concentration of the nectar. This factor probably is responsible for some part of the apparent difference but that it could account for all of it seems to the writer improbable.

But the explanation which to the author seems most plausible is that the milkweed nectar was twice as rich in sugar as was that from gladiolus. So in order to bring about proper conditions for rapid inversion of the sugar, it was necessary for the bees to add a greater quantity of the enzyme to the more concentrated solution, thereby reducing its concentration to a greater extent than was necessary in the case of the more dilute nectar from gladiolus. It is well known in regard to the inversion process, that the more concentrated the solution, the slower the action.

Are we, then, to conclude that a dilution instead of a concentration process goes on in the honey-sac between the flower and the hive entrance? The data at hand are not considered sufficient to warrant such

a conclusion. They are ample, however, to show that no concentration occurs between the flower and the hive. Moreover, they certainly suggest that some dilution may occur.

What, then, is the source of the droplets of clear liquid ejected by bees when carrying thin nectar or syrup? As yet no direct experiment has been carried out to determine this point, but methods have been worked out by means of which it is hoped the answer may be secured during the coming season.

Concentration By Evaporation

If we consider the excretion theory disproven, the only remaining explanation that has been offered as to how bees concentrate nectar is that of evaporation. Does this method adequately account for the actual rate of concentration? Brünnich (7) believes it does not, and cites the work of Huillon as well as some experiments of his own. It is impossible to describe or discuss these experiments in a paper as brief as this one must be, so let it suffice to say that the methods used by both of these investigators were so indirect and the experiments so wholly lacking in controls that the results obtained are scarcely comparable to those secured by the direct methods and careful controls employed in the present investigation.

It remains to be shown whether evaporation can and does proceed at a rate sufficient to account for the observed facts. Evaporation of nectar is known to have two phases: evaporation from the tongue of the house-bee, and from the cells of the comb. The first mentioned phase has been discussed by the writer in previous articles (9, 10), so it will be necessary only to remind the reader that during the manipulation of the nectar by the mouthparts of the house-bee, a most excellent opportunity for rapid evaporation is provided. It is not known whether the nectar is handled in this manner more than once, but if it is this would account for a very rapid rate of evaporation. While the extent to which nectar is concentrated by this means is not yet definitely known, there are reasons to believe that it may be the most important single factor in the concentration process.

Evaporation from the cells of the comb also presents two phases: evaporation from hanging drops of thin nectar, and evaporation from the new honey after being placed in the cell in the usual manner. Here again the writer has already shown, in the articles referred to in the preceding paragraph, that when nectar is being brought in more rapidly than it can be taken care of in the usual way, the house-bee does not stop to manipulate each load as received but "hangs it up to dry."

A tiny droplet is hung in the roof of each of several empty or partly empty cells, which frequently are occupied by eggs or young brood. These small hanging drops present relatively large surfaces from which moisture can escape rapidly. Later the droplets are collected and it is assumed they are then put through the usual process of manipulation by the mouthparts. This phase of evaporation must be of considerable importance at times of heavy yields, especially when the nectar is very thin.

So far we have been dealing with phases of evaporation, the importance of which seems apparent, but a measure of their importance is not readily established. It was found feasible, however, to obtain valuable data on the rate of evaporation from nectar located in its usual position in the cells. The experiment follows.

Glass cells, having the same diameter and depth as worker cells, were prepared. A frame was made having sockets to receive and hold them in the position of the cells in a comb. The cells were thoroughly cleaned, dried in the oven, and carefully weighed on chemical balances. Nectar freshly collected from gladiolus was placed in the cells and the amounts accurately determined by weighing. The cells were then fitted into their sockets and the whole frame was enclosed in a wire screen cage which allowed the entire apparatus to be hung in a normal colony next to a frame of brood. No bee could reach these cells, but the warmth of the hive and the currents of air were free to play their parts.

It was expected that the amount of nectar in the cell would influence the rate of evaporation, so three sets of cells were used, one set had only one drop at the back of each cell, the second set was filled about one-fourth full, and the third nearly three-fourths full. At the end of 24 hours, some of the cells of each set were removed, their loss in weight, and their sugar content determined. Whenever analyses showed less sugar than had been found in the nectar when first gathered, it was considered that fermentation had set in and the results were treated accordingly. But so long as no sugar was lost, the losses in weight were considered to be due to evaporation alone. At the end of the second day, another lot of cells was removed and treated in a like manner, and so on for a period of seven days.

For the sake of simplicity, let us discuss the results of this experiment in terms of concentration, keeping in mind the fact that ripe honey has a concentration of about 80 per cent. For convenience let A, B and C represent the three groups of cells, group A having the least and C the most nectar. The results for groups A and B were so nearly identical

that the figures for group B only will be mentioned. The nectar when first collected, contained 13.5 per cent sugar. Briefly stated, the concentration for group B actually rose to 79.5 per cent or that of ripe honey during the first 24 hours. During the next six days there was comparatively little change.

The results for group C must be qualified because fermentation set in before the end of the first day. The amount of sugar lost in this way was so slight, however, that considerable light was thrown on the rate of concentration in cells nearly filled with thin nectar. If we assume, in this case, that all loss in weight was due to evaporation, then the nectar in the cells of group C advanced in concentration to 30 per cent the first day. That is, it only a little more than doubled its original concentration whereas, the nectar in groups A and B increased its concentration six-fold in the same length of time. Had there been no fermentation the actual rate of concentration for group C would have been a little lower than that indicated above. Hence the expectation was borne out that, within certain limits, the larger the amount in a cell, the more slowly evaporation takes place. (A large amount of available comb space must greatly facilitate the concentration of nectar.) After the first day, fermentation progressed so rapidly in group C that further results were not usable.

Other experiments along this line were performed but space does not permit a description of them here. Without exception they all showed a very marked loss by evaporation during the first day, often a moderate loss the second day, and sometimes a small loss the third and fourth days. The rate of loss was found to depend principally upon three factors: the relative humidity of the atmosphere, the amount of nectar in the cell, and the initial concentration of the nectar. The higher the initial concentration, the more slowly did it lose water.

The results of further experiments are needed before drawing ironclad conclusions, and further work along these lines is contemplated. The present paper is offered only as a preliminary report, but it is believed the experiments related above are sufficient to show, beyond any reasonable doubt, that evaporation from nectar in the cells can account for a very large part of the concentration process. It is the author's belief, however, that the evaporation which takes place from the mouthparts of the house-bee may be of equal importance; and that evaporation in its several phases can fully account for the observed rate of nectar concentration.

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CHAIRMAN J. I. HAMBLETON: I will call for the next paper.

GASEOUS CHLORINE AS A DISINFECTANT FOR AMERICAN FOULBROOD INFECTED COMBS[1]

By RAY HUTSON, *Assistant Entomologist, N. J., Agricultural Experiment Station*

ABSTRACT

Gaseous chlorine, commonly used as a water purifier, killed *Bacillus larvae* the causative organism of American foulbrood in 48 hours. This was demonstrated by culture and field experiments. The treatment of infected combs with this gas cuts labor costs but has the disadvantages, as used, of injury to frames, and where honey is present, to bees.

The beekeeper who has not wished for a cheap comfortable method for making American foulbrood infected combs usable again must be unimaginative. Fumigation such as that employed after scarlet fever and other contagious disease has suggested itself to many. France (1) tried out a scheme apparently patterned on this idea in 1903. Formaldehyde gas did not disinfect any better then than it has in later years as shown by White (2,3), by Maasen and Borchert and by Borchert (4). Gaseous chlorine, extensively used as a water purifier, would doubtless have been tried against foulbrood long ago were it not for its much advertised danger in handling which appears rather overrated when it is recalled

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that 65% of North America's population drink chlorinated water (5), a fact necessitating the daily handling of chlorine in quantity by men of many grades and variations of intelligence. No trouble whatever was experienced in the experiments detailed. The precautions observed were those of keeping the valve on the chlorine container closed when not in use and keeping to leeward when it was.

PRELIMINARY TESTS. Before any combs were treated with chlorine microscopic examination of the material was made and the gross diagnosis confirmed (6).

The laboratory tests of gaseous chlorine as a disinfectant for American foulbrood were made by subjecting pieces of infected comb 2 x 3 inches to the gas in museum jars with water present. The moisture being introduced because chlorine is more active in its presence. The combs remained in the gas filled jars 48 hours. The pieces of comb were then allowed to dry and slant cultures made on Jones (7)modification of Sturtevant's yeast extract agar, observing the usual precautions of asepis. No growth was evident after 48 hours incubation at 37°C., of five cultures from open and five cultures from sealed cells, in each of the four pieces of comb used. The tests were twice repeated with like results.

APPARATUS. These trials resulting in apparent disinfection the next step was to treat whole combs. The devising of a cheap container that would retain the gas long enough to accomplish disinfection of several combs at once, presented considerable difficulty. It was finally surmounted by nailing on a bottom and hinging a cover with paraffine impregnated felt gaskets to a "Modified" Dadant hive. Inlet for the gas was provided by a copper tube sealed in near the bottom at one end by means of a rubber stopper. Means for the escape of air as it was displaced by chlorine was provided by a glass tube sealed in near the top of the container at the opposite end. Both tubes had short lengths of rubber tubing fitted with screw pinchcocks. A thorough coat of hot paraffine to the inside of the box and it was ready for use.

THE TREATMENT. About a quart of water was poured in the bottom of the container. Four dry infected brood combs and four infected brood combs containing a few cells of honey were hung in by resting the end of the topbars on the metal rabbits left in the one time hive body. The cover was then closed, fastened by a hasp, and sealed with hot paraffine. The next step was to connect the gas cylinder to the inlet. Chlorine was then let in until its characteristic yellowish green color was very apparent in the glass outlet tube. The valve controlling the flow

of gas was then closed and the pinchcocks clamped on the rubber tubing, thus subjecting the infected combs to the action of the gas at atmospheric pressure. Batches of combs were treated in this way for varying periods, removed and placed in a screened enclosure for the marked chlorine odor to dissipate. This was not complete after 62 days exposure.

FIELD TESTS. A comb which had contained no honey when fumigated for 48 hours was placed in a colony April 16th, 1925, and examined daily. The first eggs were seen in it April 23rd. From that time on it was examined weekly. No foulbrood having appeared by June 2nd, 1925, more combs were placed in colonies in another yard. Two hives received dry combs and two hives had combs containing cells of honey. All had been fumigated 48 hours. These colonies were examined July 3rd and clean brood found in the treated combs. On August 16th, 1925, however, all had developed American foulbrood as had the other three colonies in the yard. The first comb tried still had clean brood. That fact and the circumstances surrounding the infection of the second yard called for another trial. This was had during the season of 1926. Dry combs and combs containing honey were fumigated 2, 3, 4 and 8 days and given to queen right colonies. Weekly examinations until brood rearing ceased late in October failed to show the presence of American foulbrood.

ADVANTAGES. Calculation shows the cost of this method has the advantage of cutting labor cost about 90%. If repeated trials still show no infection from stray cells of honey this will cut labor costs still more. No molds or insects are apparently present after treatment. Overlooking a cell or two of honey does not mean reinfection.

DISADVANTAGES. Chlorine attacks any exposed metal. Honey in a comb is extremely messy after treatment with chlorine. It apparently kills approximately 1% of larvae and bees when as much as two pounds are present. Bees do not take to the treated combs as readily as they should.

SUMMARY. Gaseous chlorine used in the presence of moisture at atmospheric pressure killed the spores of American foulbrood in dry brood combs and in brood combs containing occasional cells of honey in 48 hours. A paraffine coated box holds the gas at the pressure used for sufficient time to kill the germs. The gas attacks any metal about frames and renders any honey present very messy and is apparently poisonous to bees.

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MR. JAMES C. GOODWIN: Did the chlorine affect the wire in the foundation, when using wire combs or wire foundation? How long did you retain the comb before you put them back in the hive where you got your kill of one per cent of your brood?

MR. RAY HUTSON: It did not attack wire in the comb; it attacked wire where it was exposed. "Any exposed metal," the wording of the paper was, "was attacked." Wires imbeded such as in the vertical wired foundations were not attacked. You see there is no pressure there. It is atmospheric pressure and beeswax is comparatively an inert chemical substance. The bleaching, of course, of the organic matter other than the wax was quite noticeable.

In regard to your other question of how long they were kept out, they were kept out as long as the period that I mentioned there, sixty-two days, and still we had that trouble. That is the only thing I could tie it to, because we did not have it in the dry comb. There is one of those hives that has been going two years with those combs in it.

DR. E. F. PHILLIPS: I was going to say that it occurred to me when Mr. Hutson was describing his experiment there might be some trouble in the utilization of a method such as this by changes in atmospheric pressure externally. We get a shifting of atmospheric pressure approximating one inch between high and low pressure areas. That could be very readily overcome by introducing a little rubber balloon between the gas intake and the hive and leaving that constantly in contact so that the pressure of the gas inside would always equal that of the gas outside.

MR. RAY HUTSON: That is the same scheme that the Standard Oil and other gas companies are using on their gasoline storage tanks.

DR. E. F. PHILLIPS: The reason it occurred to me is because that is always used, for instance, in the experiments. It always must equalize the pressure inside and outside and on a box as large as a hive, with a difference of one inch in the atmospheric pressure you get quite a cracking or bulging of the thin cover, or something of that kind.

CHAIRMAN J. I. HAMBLETON: I would like to ask Mr. Hutson whether the damage to the metal was serious during the time when the combs were being treated.

MR. RAY HUTSON: In all cases where the wires were exposed, you know the corners of the combs where the wire would be exposed, it was eaten through—that was No. 28 wire. Forty-eight hours was the minimum treatment. In all treatments I had that trouble.

CHAIRMAN J. I. HAMBLETON: I would like to appoint a Nominating Committee. On this committee I would like to appoint Professor Robinson, Mr. Sams, Dr. E. F. Phillips.

I wish this committee would report before we adjourn.

DR. E. F. PHILLIPS: I wonder if I might say a few things while Dr. Bertholf is getting ready. We all listened to the remarks of the Chairman this afternoon with a great deal of interest when he discussed the situation with regard to a national organization of beekeepers. For the benefit of those who were not present at Medina, Ohio, at the Root-Langstroth Memorial meetings which were held there in September, it might be well to say that at that time Mr. Hambleton brought this same question forward and proposed that a national organization of beekeepers be formed. We met rather informally at Medina to discuss this subject and at that time it was the consensus of opinion that it would be desirable for Mr. Hambleton to constitute himself a committee of one with such assistance as he might be able to get from others to outline a program for such an organization and to write a constitution or by-laws and whatever else might be necessary for the formation of such an organization.

In the meantime Mr. Hambleton has done this work. I don't know whether he had any help or not, but at any rate the work is completed and he has here a constitution and a set of by-laws for such an organization. If it is in order, Mr. Chairman, I move that immediately at the conclusion of the discussions this afternoon we take up the matter of the discussion of a national organization of beekeepers.

CHAIRMAN J. I. HAMBLETON: You have all heard Dr. Phillips' motion. Is there a second?

. . . The motion was seconded and carried. . .

CHAIRMAN J. I. HAMBLETON: We will take up that discussion immediately after the selection of officers.

I will now call on Professor Bertholf.

THE RELATIVE SENSITIVITY OF HONEYBEES TO LIGHT OF DIFFERENT WAVE-LENGTHS

By L. M. BERTHOLF, *Western Maryland College, formerly of Bee Culture Laboratory, U. S. Dept. Agriculture*

ABSTRACT

Honeybees two or three at a time, were placed under a large petri dish into which entered two narrow opposed beams of light, the intensity of one of which could be varied by means of a rotating disc photometer. The bees in trying to get out of the dish ran to the two spots where the beams entered. By counting the number of times they bumped into the glass at each of these two points one could ascertain which light had the stronger stimulating effect. Colors, except yellow, were obtained by the use of Corning glass filters, the yellow filter being a potassium dichromate solution. The transmission curve of each filter was accurately known, the peaks of the curves being well separated. Violet, blue, green, yellow, and red were used. When each of these colors was opposed by a white light it was found that the latter had to be reduced by a certain amount in order to equalize the opposing color in stimulating effect. Using, then, the total radiation per unit area of each filter, as determined at the Bureau of Standards, the relative stimulating efficiency of the colors turned out to be as follows: green 100, blue 54, yellow 29, violet 23, red 2. When these numbers are plotted on the same scale as the curve of the relative sensitivity of the human eye, as worked out by Coblentz, it is found that the curve lies farther toward the violet end of the spectrum than does the curve for the human eye and does not extend as far into the red. It shows decidedly that red does not stimulate bees as much as it does humans, and that violet stimulates them more than it does humans.

MR. GEORGE H. REA: My work is among the practical beekeepers. A few years ago while Dr. Phillips was in Washington he told me of some experiments he had carried on along this line. He gave me the idea that it might be practical to use a red light in a bee cellar in putting bees into a cellar and taking them out again. I found it was very highly practical. If we use a white light when setting bees into a cellar, a great many of the bees will fly out and go to the light, but when we use a red light, we find very rarely if ever a bee goes toward the light. It doesn't seem to attract them out of the hive. It has an intensive practical value.

CHAIRMAN J. I. HAMBLETON: I see that Mr. Frison has come into the room, and I will call on him for his paper.

THE FERTILIZATION AND HIBERNATION OF QUEEN BUMBLEBEES UNDER CONTROLLED CONDITIONS. (*BREMIDAE:* HYM.)[1]

By Theodore H. Frison, *Illinois State Natural History Survey*
Urbana, Illinois

Abstract

The fertilization and hibernation of queen bumblebees under controlled conditions is essential if these useful insects are ever to be domesticated, or semi-domesticated, by man. Experiments of this nature were conducted during 1916, 1917, 1919 and 1920. The results prove that the fertilization and hibernation of certain species of queen bumblebees can be obtained under controlled conditions.

In the fall of 1916, 1917, and 1919, I conducted a series of experiments to determine whether or not the copulation and resultant fertilization of *Bremus* queens could be secured under controlled conditions. The only experiments of a similar nature, of which I am aware, are those of Sladen (1912). In one of the experiments conducted by this investigator, copulation was observed to take place between the queens and males of *Bremus lapidarius* (Linn.). There have been, also, but few attempts to induce bumblebees to hibernate under controlled conditions. Mr. Warren Williamson, in 1910, at Urbana, Illinois, tried to winter a large number of queens of *Bremus americanorum* (Fabr.), but they all died. One of these queens, however, still exhibited weak signs of life on the first of April. In England, Sladen (1912) tried to winter bumblebees, but never succeeded in keeping a queen alive later than the eighteenth of September.

A. Mating Experiments

All of the queens used in my mating experiments were reared from colonies housed in observation boxes. The males were either reared in the same manner as the queens or collected from flowers and brought alive into the laboratory. Quart glass fruit jars, the tops of which were tightly covered over with several layers of cheese cloth and the bottoms of which were lined with corrugated paper to afford the bees a good footing, served admirably as cages during the course of these experiments. Old bumblebee cocoons, fastened in the middle of the corrugated paper bottoms, were used as containers for the liquid food supplied the bees. When I was ready to begin a mating experiment I usually placed

[1]Contribution from the Entomological Laboratories of the University of Illinois, No. 110. Extract number four from a thesis presented to the Faculty of the Graduate School of the University of Illinois in May, 1923, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

a queen and one or more males of the same species in the same jar. Prior to this time, the males and queens were kept apart. I have found that males isolated from the time of their emergence from queens are more easily incited to attempt copulation, when suddenly placed with a queen, than are males kept continually in association with them. I have also observed the same reaction in the case of fossorial wasps of the genus *Tiphia*. In some instances the introduced male was indifferent to the queen and I found it desirable to substitute another male. This shifting about of males often had the desired effect. It sometimes happened that the queens killed by stinging the males first placed with them but then later accepted another male. In a few extreme cases, the queens immediately killed or repeatedly viciously attacked all males placed with them.

During the early part of July, 1917, I tried to secure the fertilization of reared queens of *Bremus bimaculatus* (Cress.) by tying a fine thread about the body of a queen and then fastening the free end of this thread to some tree, bush, or flower growing in the open. I tried this with so few queens, however, that I can not judge of its true worth. It merits recording, nevertheless, that by this means males could be attracted to queens, but copulation was never observed. A detailed discussion of the normal manner in which the queens are fertilized and the various actions associated with this activity are given in another paper dealing with the general behavior of these social insects.

Table 1 gives in tabulated form the results of sixty-six mating experiments tried in 1916, 1917, and 1919. This table clearly shows that my efforts were rewarded with gratifying results. Furthermore, I have no doubt that with the information I now possess concerning the factors requisite to success, the failures could be substantially reduced. This is evident when one considers that I obtained better success each succeeding season that the experiments were conducted. It is interesting, also, to recall in this connection that the controlled fertilization of the honeybee has not been satisfactorily achieved.[2]

In studying the figures in Table 1 it must be borne in mind that an experiment was judged a success only when the bees were actually seen *in coitu*. As I did not have an opportunity to observe them continuously, some of the experiments listed as resulting questionably or unsuccessfully may have had a successful termination. This is support-

[2]A recent article in the American Bee Journal (November, 1926) reports the successful accomplishment by Mr. L. R. Watson of Cornell University of the artificial mating of the queen honeybee.

ed by the fact that in many experiments listed as failures, the males were observed at one time or another attempting to copulate with a queen. In 1916, single queens were used in all experiments, but in 1917 and 1919 as many as thirty queens and twenty-five males were used in a single experiment. Thus, though only sixty-six experiments were performed, a total of one hundred and thirty-eight males and one hundred and forty-four queens were under observation.

TABLE 1

Year	Species	Number of Experiments	Successful	Questionable	Failures
1916	*B. americanorum* ♀ ♂	33	11	15	7
1916	*P. variabilis* ♀ ♂	4			4
1916	*P. variabilis* ♀ *B. americanorum* ♂	1			1 (mating attempted)
1917	*B. bimaculatus* ♀ ♂	2	1	1	
1917	*B. auricomus* ♀ ♂	3			3
1917	*B. americanorum* ♀ ♂	17	14	3	
1917	*B. americanorum* ♂ *B. auricomus* ♀	1			1 (mating attempted)
1917	*B. americanorum* ♂ *B. auricomus* ♀	1		1	
1919	*B. bimaculatus* ♀ ♂	1		1	
1919	*B. vagans* ♀ ♂	3	3	x	
1919	*B. americanorum* ♀ ♂	1	1		

B. HIBERNATING EXPERIMENTS

Several years previous to 1916 and 1917, I tried to induce bumblebee queens to hibernate. These queens were secured in fall from every possible source. Frequently more than fifty queens were used in these early experiments, but the queens always died before December of the same year. Repeated failures led me to believe that temperature conditions and the lack of fertilization were responsible for the death of these queens. Therefore, in 1916, 1917, and 1919, I allowed the queens access to males for several days before trying to use them in hibernating experiments. Because of other duties I was unable to watch these queens and males constantly, and therefore could not determine in most cases whether or not the males and queens mated. In some cases, however, the bees were observed *in coitu* and were accordingly considered as fertilized. The remainder of the queens had access to males and may or may not have been fertilized. Notwithstanding the fact

that all the queens were not actually seen *in coitu*, this certainly placed the experiments on a sounder basis and gave more promise of success.

After the queens were allowed access to males, I placed them in separate jars for a few days and provided them with an abundance of pollen and diluted honey. This procedure was then followed, in the fall of 1916, by placing the queens out of doors during a cool night in order to get them into a stupor for transfer to cold storage. The following morning I removed all queens treated in this manner to cans containing loose soil and dried leaves, and then put them in one of the cold storage rooms of a local ice plant. Thirty-six experiments of this character were made in 1916–1917, involving twenty-eight queens of *Bremus americanorum* (Fabr.), one of *Bremus separatus* (Cress.), and seven of *Psithyrus variabilis* (Cress.).

In the fall of 1917, because of my many failures in 1916, I tried out new methods of hibernating queens which had previously had access to males. This time I placed several well fed queens in separate small glass jelly jars with perforated lids. These jars contained a small amount of loose soil and old leaves. Several other queens were placed in perforated paper mailing tubes, which in turn were enclosed in quart fruit jars with perforated lids. The remaining queens were placed in mailing tubes inside perforated tin cans containing a small quantity of loose soil and old leaves. All of the tubes, jelly jars and fruit jars were then buried about a foot from the surface in a small mound of earth or directly in the ground. Eleven separate experiments were made in 1917–1918, in which were used eleven queens of *Bremus americanorum* (Fabr.), seven of *Bremus bimaculatus* (Cress.), and three of *Bremus auricomus* (Robt.).

In 1916–1917, I did not succeed in hibernating a single queen. A queen of *Bremus separatus* (Cress.) found on October 14, 1916, hibernating in a natural state in a log in the Brownfield Woods, Urbana, Illinois, by Mr. H. G. M. Crawford was still alive on March 29, 1917, but never recovered sufficiently to make the experiment a success. In 1917–1918, four queens of *Bremus americanorum* (Fabr.) were hibernated with perfect success. These queens were the ones placed in paper mailing tubes within fruit jars and cans on October 1, 1917, and then buried in a mound of earth. Because of an interruption of my studies these queens were allowed their freedom in April, 1918. A queen of another species, *Bremus bimaculatus* (Cress.), which was placed in similar hibernating quarters on September 3, 1917, was alive and apparently healthy when removed on March 2, 1918. In 1919–1920, I partially succeeded in

hibernating a queen of *Bremus auricomus*. In this latter experiment, however, the queen died on February 10, 1920, several days after she had been forced to become prematurely active. Because of the success obtained in 1917–1918, only a couple of experiments of this nature were undertaken in 1919–1920 and none in subsequent years

I am sure one factor influencing the heavy mortality in these experiments, particularly my first experiments, was that the queens were kept too long under conditions demanding a fairly high rate of metabolism. Under natural conditions the new queens do not fly about much after leaving the nest, and shortly after leaving it seek hibernating quarters. Many of the queens used in these experiments were kept active under warm laboratory conditions almost a month longer than they were to be seen flying in the field. The fact that many of them were found dead in their hibernating quarters but a short time after being placed there is ample evidence of the deleterious effects of such treatment. There is apparently no reason, however, why large numbers of well-fed, fertilized queens placed in hibernating quarters at the proper time of year can not be succesfully hibernated by the methods used by me in the fall of 1917.

CHAIRMAN J. I. HAMBLETON: Is there any discussion on this paper? If not, we will call on the Nominating Committee for their report.

DR. E. F. PHILLIPS: The Nominating Committee finds it is somewhat handicapped because of the fact that according to the regulations of the Association, only active members can hold office. There are quite a number of associate members, and I would suggest before the next meeting some of them take steps to make themselves eligible for office. (Laughter).

We desire to nominate Professor F. E. Millen of the Ontario Agricultural College as Ghairman, and following a long custom of the Association, we desire to nominate Professor Bentley as Secretary.

I move that nominations be closed and no objections be entertained.

CHAIRMAN J. I. HAMBLETON: Any discussion?

...The motion was carried...

CHAIRMAN J. I. HAMBLETON: That finishes this part of the meeting. We will have a session in the Medical Hall this evening.

DR. E. F. PHILLIPS: I move that we adjourn and proceed to discuss the other question.

...The motion was seconded and carried and the meeting adjourned at three-thirty o'clock...

Wednesday Evening, December 29, 1926

The meeting convened in the Medical Hall of the University of Pennsylvania at eight-five o'clock, Mr. J. I. Hambleton presiding.

CHAIRMAN J. I. HAMBLETON: The first paper on the program is by Dr. Phillips on "Some Things I saw and heard while visiting Beekeepers and their Societies in Europe in the Summer of 1926." Dr. Phillips needs no introduction.

...Dr. E. F. Phillips addressed the meeting for one hour on his European trip...

BEE JOURNALS AND ORGANIZATIONS IN EUROPE[1]

By E. F. PHILLIPS *Ithaca, N. Y.*

ABSTRACT

The status of beekeeping publications in Europe is discussed and the desirability of official organs by the various organizations of beekeepers in the United States is suggested.

In German Switzerland, having an area about equal to that of four New York counties, there is a strong association of beekeepers which publishes an official organ which goes to all of the 17,000 members. French Switzerland is equally well organized and the society maintains an excellent official organ. In France practically every Department has a strong society of beekeepers with an official organ. Each departmental society in France does not publish its own bee-journal but several of the bee-journals are reprinted under different names for the different societies. In this manner the beekeepers of the entire country are well provided with current information on all beekeeping subjects.

In Great Britain the situation regarding bee-journals is somewhat different from that on the continent. The British Bee Journal is not published by the British Beekeepers' Association but is privately owned. It is, however, the official organ of the Association and goes to all members. Some of the county associations in England are not affiliated with the general society and in some cases these county societies issue their own organ. For example the Kent, Surrey and Gloucestershire

[1]At the evening session of the Apiculture Section, December 29, the author addressed the Section on a visit to Europe during the summer of 1926, during which time he had opportunity to visit twenty-five associations of beekeepers. Since space will not permit the publication of the full talk, it seems desirable to limit the present paper as indicated by the above title. These remarks constituted the close of the talk before the Apiculture Section.

societies publish a fine journal, Bee Craft, as their official organ. The Bee World, the organ of the Apis Club, is widely read, but it occupies a somewhat different place in beekeeping, since the Apis Club is an international organization, the organ of which goes to all members in all countries.

Scotland is thoroughly organized and the federated societies publish an excellent journal. Wales and Ireland also support official organs through their federated societies.

In other countries on the continent of Europe, the organizations of beekeepers are even stronger than in the countries visited last summer. Exact data are not available, but there is reported to be a federation of beekeepers in Germany numbering 180,000 members. Austria is also well organized and the same is true for other European countries. In all these cases, the societies are strengthened and maintained through the publication of official organs.

When one of the European societies is formed, it appears that almost the first step is the establishment of an official organ through which the members may be kept in touch with their society. By this means also the beekeepers are provided with information of a current nature on beekeeping topics. Since the publication of a journal entails a heavy financial burden, the success of the society necessitates the getting of as many members and consequent subscribers as possible, so that it becomes necessary that those interested in beekeeping be sought by every possible means. Instead of the listless attitude so often encountered in our societies, there is a constant hunt for interested beekeepers to assist in supporting the societies and their journals.

By way of marked contrast, let us look at the journal situation in the United States. It is doubtful whether more than 30,000 out of the 800,000 to 1,000,000 persons who own bees in the United States subscribe for a bee-journal. A few of our societies have undertaken the publication of official organs, but in all these cases they have avoided direct competition with the existing bee-journals. Two of the bee-journals published in the United States have a distribution of national scope and both are excellent journals, worthy of being read by beekeepers everywhere. Other bee-journals have a more limited appeal and consequently a more limited distribution.

Since under the present arrangements for the distribution of current beekeeping literature in the United States only a small fraction of the beekeepers are receiving a bee-journal, one is led to the belief that we might take a lesson from the experience of our European co-workers and

that progress in beekeeping in the United States might be greatly assisted by the establishment of official organs, at least by the more powerful state societies. We can not afford to follow the example of the European societies blindly, but if after a careful study of our conditions it appears desirable to establish such journals, then this program should be pushed actively throughout the country. I am strongly of the opinion that this is the most vital immediate step in the development of American beekeeping.

Since the two bee-journals which now enjoy a national distribution are of such high class, some may feel that nothing should be done which will in any way work to their detriment, and in this view I heartily concur. There is, however, reason to believe that competition from official organs would assist rather than hinder these journals, if in no other way, by bringing these journals to the attention of beekeepers.

Beekeeping in the United States is at present in a state of depression, owing chiefly to a disorganized honey market. The present does not at first glance seem a propitious time to launch new journals, yet on the other hand beekeeping was never in greater need of every possible assistance. If the establishment of some strong official organs would help materially in the revival of interest on the part of beekeepers, or if they would assist the beekeepers by helping them to understand the marketing situation, then there was never a time when such organs were more badly needed.

CHAIRMAN J. I. HAMBLETON: Are there any questions?

This afternoon after the Section on Apiculture adjourned we discussed a little while the formation of a national organization. After hearing Dr. Phillips recite his experiences, as he says he is only giving you a small part, I wonder what we beekeepers would do if some famous European beekeepers came over to this country. I don't think we could reciprocate under present conditions of disorganization.

The next feature of our evening session will be a demonstration of the instrumental insemination of the queenbee.

DEMONSTRATION OF INSTRUMENTAL INSEMINATION OF THE QUEENBEE

By LLOYD R. WATSON, *Cornell University, Ithaca, N. Y.*

ABSTRACT

The breeding of honeybees along definite lines of genetical and race improvement has to the present been impossible because the mating of the queenbee could not be controlled. She pursues her once-for-life nuptials in the open air free on the wing and she persistently refuses to mate under any other conditions.

After 150 years of research by numerous experimenters in many lands, it has now for the first time been conclusively demonstrated by Dr. Lloyd R. Watson of Cornell University that she can at least be outwitted. By means of a sort of surgical operation involving very delicate microtechnique which is carried out under the lenses of a binocular microscope, the sperm from a selected drone is dissected out, and with the aid of a microsyringe, which in turn is stabilized and controlled by a micromanipulator, it is injected into the oviduct of the virgin queen as she rests dorsal side downward in a cradle carved out of a tiny operating-table, and held motionless by several loops of silk thread thrown over her body and around the table.

To the present time about 50% of all the treated queens later showed insemination ranging all the way from perfectly normal down to very slight. This procedure is not adapted to the use of the ordinary beekeeper, nor to that of the ordinary commercial queen-raiser, but it is adapted to the use of any microscopist who knows bee-behavior and who can bring to the problem a fine degree of manual control.

The bees which you see before me on the table have come all the way from Texas to be here tonight. The shipping north of queens and drones in the dead of winter is in itself an experiment. They have arrived in fairly good condition as regards the queens, but the drones have not stood the journey so well and many of them are dead. The queens are of course in individual cages but the drones came scattered thru about three pounds of workerbees, and we thot it necessary to etherize the whole stock it order to sort out the drones from the workers.

We are never too old to learn, and I have just learned that drones take ether much more easily than workers or queens do. As a result many of our drones did not recover consciousness, altho we gave the lightest amount of ether which would still make the workers desist from flying. However, we are fortunate in that, as many previous experiments have shown, the sperm in mature drones may remain alive and active for a long time after the drone is apparently dead if the temperature is not too low. I believe that we shall have no trouble in getting active sperm for this occasion.

I want to say a word about "artificial." This word has bothered me for a long time. I have not liked the word "artificial" in connection with this operation. In the first place no new or artificial substance is substituted in place of a natural substance. It seems to me that placing

semen in the oviduct of a queenbee by instrumental means is no more artificial, or not indeed so artificial as Caesar was, and we hardly speak of him as artificial.

I have been searching in my mind for some word to use instead of the word "artificial." As far as possible I am going to omit from this discussion the word artificial and I am going to employ the word "instrumental" in its place.

The problem of controlling the mating of honeybees is a time-worn problem, and it has been attacked from many different angles. I think I have attacked it from about all the different avenues of approach that anybody ever has. Of course those ways were not original with me, for a long list of respected and conscientious experimenters have struggled with this problem for 150 years. In common with others I have tried confining virgin queens with drones in limited spaces. I have tied queens out on a lariat to fly among drones. I have tried holding the queen and the drone in juxtaposition in an effort to effect a sort of forced copulation, but never with success. Finally in 1923, after several years of trials and failures of various sorts, it occurred to me that instrumental insemination by a sort of surgical operation seemed the most likely to give success, and I began seriously upon this line of attack then.

I once saw a recipe for making rabbit soup, and it gave this advice which is probably sound and which I have never forgotten: The first consideration in making rabbit soup is to secure the rabbit. Well, the first consideration in the instrumental insemination of the queenbee is to secure the queen so that she shall be held perfectly still and unable to wiggle her thorax or her abdomen. She must be placed in this condition without being hurt and she must at all times be kept comfortable. Here is a virgin queen from southern Texas. The fingers of the operater must be soft enough to handle the queen without hurting her, and if the handling of a queen simulates a scuffle, then we may be almost certain from the first that the experiment will not be a success.

This queen is placed dorsal side downward in this little cradle which I have hollowed out of this piece of wood, and which exactly fits her head, thorax and abdomen. I carefully wind her down with this silk thread. Most of the pressure must come on the thorax; it must not come on her abdomen, and I must be very sure that none of the strands fall over her throat. As I wind I withdraw my thumb, always noting that her legs and wings are left in a natural and comfortable position. The bee is such a non-communicative organism that there is no language in which

we can speak to it, and it can give back no communication to us. We possess so little in common with bees that it is hard for us to sympathize with them, but we must have a certain sympathy for them if we are to succeed with this business. Now the queen is secure on this little operating-table. She is perfectly helpless but she is comfortable. I will turn her over to you to be passed from hand to hand for your examination while I prepare the syringe.

I have never had such a fine opportunity to study the virility of drones. I believe that drones are not functionally mature before they are ten or twelve days old, and they are much better when they are older than that. For this demonstration I asked for drones that would be older than ten days, and I suspect that these are older for I noticed that when they took the ether many of them ejaculated. This is a sign of maturity.

Having selected a drone which appears normal, I snip off his head. Curiously enough the shock of decapitation sets up stimuli in a drone which very closely simulate natural copulation, and if a drone is anywhere near the right age, he will usually ejaculate forcibly. I have usually found that if they do not ejaculate forcibly they are immature.

In nature in the act of copulation, the drone, you will recall, is not able to withdraw the penis from the vulva of the queen, and it is torn from him. Likewise, we seize this fellow in the same way and tear from him his genital organ. During ejaculation the sperm from the seminal vesicles is crowded down the ejaculatory duct first and then immediately behind that follows the pearly white mucus from the accessory mucous glands. The sperm and the mucus occupy distinct regions in the seminal pouch with possibly loose mixing, and with the unaided eye I can now see these distinct regions as the turgid seminal pouch lies upon the index finger of my left hand. The sperm is creamy yellow but the mucus is pure white. When I pass my finger into the field of this binocular microscope which is equipped with 36-millimeter objectives and 6x oculars, thus giving a magnification of 15 diameters, I can see the sperms lashing thru the transparent wall of the penis.

For this work I am using a microsyringe which I made in my private laboratory. The inside diameter of the plunger-barrel is five-tenths of a millimeter and the stroke of the plunger is 13 millimeters. This gives a working capacity of about .25 cubic millimeters. The syringe is designed to hold all of the sperm produced by a normal drone plus a little of the accessory mucus. The inside diameter of the syringe nozzle closely approximates the diameter of a queen's egg. Not until I reduced

the syringe to about this size was I able to inseminate queens without injuring them.

This syringe is mounted, as you see, in a brass block called a Barber pipette-holder, and tilted up to an angle of about 40 degrees to enable me to look into the vestibule of the queen while I work. These three milled heads permit me to move the pipette forward or backward, right or left, or up and down in the three planes in space. The plunger of the syringe is controlled by this fine brass screw and head. The plunger itself is a straight piece of 30 gauge stiff brass wire and wound about the end with cotton and shellac.

We now proceed to fill the syringe. The penis of the drone still resting on my finger is first passed into the magnified field and up to the point of the syringe. The plunger is advanced till it stands just flush with the opening of the nozzle. The finger is now cautiously moved up till the nozzle of the syringe acting as a hypodermic needle, pierces the penis wall and enters the region of the mucus. By manipulating, the screw-head the plunger is backed and about one-half of a cubic millimeter of the mucus is taken up. By advancing the finger again the nozzle is now made to enter the region of the creamy sperm and this is all taken up. As the now collapsed penis is withdrawn from the nozzle a tiny drop of the mucus is allowed to cover the open end of the syringe to protect the sperm from the air and from desiccation while the queen is being arranged on the stage of the microscope.

Is there anyone who would like to look thru the microscope to see the loaded syringe. The lashing of the sperms is quite visible. (Those present passed by the microscope to see Dr. Watson's work.)

Now the queen has been resting on the operating table comfortably for twenty minutes or more. She has been fed. So now we proceed to inseminate her. She is placed on the stage of the microscope with the tip of her abdomen in the middle of the field and pointing toward my right. Now comes the critical test of one's nerve. The making or the ruining of a perfectly good queen lies in this operation. Sometimes I sit for a moment or two and try to hold the points of two needles together to train and calm my control. With this pair of finest-pointed tweezers in the left hand and a moderately sharp applicator in the other hand I cautiously approach the queen and force the genito-anal plates apart and place the points of the tweezers between them in such a way that when the tweezers are allowed to open a little, the oviduct, sting, rectum and vestibule floor are exposed to view. With the microscope lamp and reflector properly placed the vestibule is now flooded with

light. As I manipulate the screws of the pipette-holder with the right hand the syringe is advanced and made to stand just over the opening of the oviduct but not yet into actual contact with it. At this point the plunger is advanced enough to break the little mucous cap which has sealed the sperm away from the air and as this is done the syringe is lowered till its tip just disappears within the vulva of the queen. While the tweezers in the left hand still retract the genito-anal plates, the right hand manipulates the plunger and the charge of semen begins to flow out of the syringe and down along the oviduct. With a light as strong as this, the floor of the vestibule is rendered quite transparent and I can easily see the course of the sperm as it descends and dilates the oviduct.

I was greatly puzzled for a long time to know whether in natural copulation the male merely deposited the sperm in the oviduct or whether he actually reached in and placed it in the spermatheca. I went so far as to make a syringe with the nozzle turning upward intended to lodge the sperm within the spermathecal duct but no operations with this instrument were successful. Furthermore, the examination of numerous young queens just returning to the hive from the wedding flight revealed the fact that in natural copulation the drone merely deposits the semen in the oviduct and the sperms then migrate by their own activity into the spermatheca.

Now the semen has all entered the oviduct and I back the syringe away. As I do this I force out the mucus which entered the syringe first as it was being filled, and leave this in the vulva of the queen just as the drone does to seal it from the air for a few hours till the sperms have had time to find their way into the spermatheca where they are safe and where they will live for years as long as the queen lives or till they are used one by one for the purpose of fertilizing her eggs.

I would be willing for you to come and view this queen thru the microscope before I let her up but perhaps we would better not keep her here much longer. Mr. Nolan, will you not please step to the microscope and perhaps you can tell them how it looks. I am going to hold the vestibule open while you glance.

MR. NOLAN: I see the plug.

DR. WATSON: Thank you. All there is to see is a mass of white mucus extending out of the vulva and around the base of the sting. This queen is ready to be released and if she wasn't too sick from the ether she could fly right off. She doesn't limp; her wings are not crumpled. She is all right. (Applause.)

Are there any questions you would like to ask?

QUESTION: How long does the mucous plug remain in the vestibule?

DR. WATSON: In normal copulation that plug will be gone in from one to five hours.

QUESTION: How is it removed?

DR. WATSON: Most of it seems to be absorbed by the queen but part of it appears later as a little hard scale. Sometimes she claws or pushes it away with her legs and sometimes the workerbees pull it away.

QUESTION: How long does the sperm remain alive after you remove the seminal vesicles from the drone?

DR. WATSON: I have observed it to remain active for two hours in my laboratory at about 80 degree temperature.

MR. HAMBLETON: Have you ever performed this operation on a drone layer?

DR. WATSON: I never have.

QUESTION: When these queens are introduced into a colony are they accepted as normal queens are?

DR. WATSON: I see no difference providing that she has been properly handled. When a queen has been wounded or pretty badly malled over, I have known the bees to refuse to accept her, but if she is all right they take her in and begin feeding her at once.

QUESTION: And her own reactions in the colony, are they the same?

DR. WATSON: They are normal. Ten minutes after she is put back into the colony you would hardly dream that she is an instrument queen.

Here is an item which I wish to mention in closing. You have never seen this in the literature but I think you will very soon. It is a common phenomenon, you know, that a newly mated queen rapidly grows larger. An experienced observer can usually tell in a very few hours whether a queen has mated because she becomes so sedate, slow and so heavy to fly. I used to wonder whence she derived that added nourishment. At the time of copulation, all of the white mucus is given to her and it is disposed of by very rapid absorption. I think that it is this which gives her the tremendous metabolic impetus to develop as she does.

CHAIRMAN J. I. HAMBLETON: I am sure that this has been quite a wonderful opportunity to see this operation performed, in view of the fact that investigators have been trying for years and years, and no one yet has been able to demonstrate the fact. While we have no proof

here that this particular queen will lay fertile eggs, Dr. Watson has been able to satisfy his graduate committee that he has done this thing repeatedly and he has queens in his own yard now that he has instrumentally inseminated that are laying in every respect normally.

So far as I know this is the first public demonstration that has been made. I am sure that we shall all look forward with great interest to what this work will result in.

OBSERVATIONS ON *BUCCULATRIX GOSSYPIELLA*, A NEW AND IMPORTANT COTTON PEST

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Abstract

A species of cotton infesting Bucculatrix (Family Lyonetiidae) described as *B. gossypiella* Morrill,[1] infests wild and cultivated cottons in the states of Sonora and Sinaloa, Mexico. The adults closely resemble another cotton infesting species, *B. thurberiella* Busck, but can be separated by the genitalia in both sexes, while the egg and larval stages of the two species are strikingly different. The larvae of *B. gossypiella* have the peculiar habit of boring in woody or hard tissues of the plant, such as stalks, branches, carpels of green bolls, leaf petioles and larger leaf veins as well as in the leaf blades and bracts with decided preference for the harder parts. Characteristic reddish spots are produced by the work of the larva in the plant tissues. Damage appears to be confined to the staining of the lint and to producing deformed and imperfectly opened bolls, usually amounting to between 10 and 30 per cent of the crop. Observations to date indicate that early planting favors maximum damage and late planting favors minimum damage but local concerted action as to delayed planting and clearing of old cotton fields may be necessary where large acreages are involved.

In the course of a survey of insects associated with Arizona wild cotton, or *Thurberia thespesiodes*, in Southern Arizona in 1913[2] a species of Bucculatrix was discovered which was described by Mr. Busck[3] as *Bucculatrix thurberiella*. This species has become very common and sometimes injurious in cultivated cotton fields of Southern Arizona and Southern California, and also in the northern part of Lower California and the northern part of Sonora, Mexico. It becomes less abundant in southern Sonora and northern Sinaloa and apparently does not exist in southern Sinaloa and in Nayarit.

The Thurberia Bucculatrix, or cotton leaf perforator exhibits feeding,

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[1]Proc. Ent. Soc. Wash., Vol. 29, pp. 94–97, 1927.

[2]Pierce and Morrill, Proc. Ent. Soc. Wash. Vol. XVI, pp. 21, 1914.

[3]Busck, Proc. Ent. Soc. Wash. Vol. XVI. pp. 30–31, 1914.

moulting and other habits typical of the genus.[4] The attack on cotton is confined almost entirely to leaf blades, with the occasional exception of the calyx and involucral bracts. In September 1923, injury by microlepidopterous larvae to the carpels of green cotton bolls was observed by Dr. W. M. Mann and the writer in the Yaqui Valley near Cajeme, Sonora, Mexico. The cocoons and adults appeared to be identical with *B. thurberiella* and it was not until the writer had an opportunity for a comparative study of all stages in the field in 1924 and 1925 that specific differences were discovered.

Distinctions Between the Two Cotton Infesting Species of Bucculatrix

The egg of *B. thurberiella* as described by McGregor is elongated, projectile shaped with about 10 projecting ridges and stands perpendicular to the leaf. The unhatched egg is pale straw color. The egg of *B. gossypiella* is flattened, scale like, has as a rule five longitudinal ridges converging toward the micropilar end. It is clear transparent or greenish color before hatching and the egg shell after hatching is light brown in color.

The full grown larvae of the two species are as easily distinguished as the eggs. That of *B. thurberiella* invariably has conspicuous black spots and whitish tubercles on every segment of the body as described by McGregor, while the larva of *B. gossypiella* has distinctively arranged black spots on the pronotal shield and anal plate and more or less obscure flattened tubercles conclorous with the yellowish body except in unusually dark colored individuals. The larvae of the former species, on account of the two rows of large black spots, are in general appearance darker than the cotton leaf while the larvae of the latter species are always more or less lighter. The average length of five normal individuals of *B. thurberiella* was 5.64 mm. with a range of 5–6 mm. while the average of five individuals of *B. gossypiella* was 4.76 mm. with a range of 4.3–5.5 mm.

Five specimens of the pupating cocoons of *B. thurberiella* were found to be uniformly approximately 5.5. mm. in length while five specimens of the cocoons of *B. gossypiella* ranged from 4 to 5.5 mm. in length, averaging 4.9 mm.

The pupae and adults of the two species differ in size, *B. thurberiella* averaging considerably larger than *B. gossypiella*. The male and female

[4]A. W. Morrill, Sixth Ann. Rept. Ariz. Com. Agr. and Hort. pp. 44–46, 1914. E. A. McGregor, Jour. Econ. Ent. Vol. 9, pp. 505–510, 1916.

genitalia of the two species are conspicuously different in structure. A comparative examination of the pupae of the two species has not been made.

In the cotton field the feeding habits of the larvae, as hereinafter described, give an infallible distinction between the species which any cotton grower can easily recognize.

Food Plants

In addition to American upland and Egyptian cottons, *B. gossypiella* attacks several species of Mexican wild cotton including *Gossypium davidsonii* Kellogg, *G. hypodenum* C. and H., *G. patens* C. and H., *G. contextum* C. and H., *G. morrilli* C. and H. and *G. dicladum* C. and H. The cultivated cottons appear to be preferred as food plants over the wild cottons.

Of the wild cotton species named, *G. davidsoni* being a practically lintless and therefore useless plant and growing in great abundance in uninhabited coast districts, appears to be the most attractive as a food plant and the most likely to be the native food plant of the cotton Bucculatrix. The other wild cotton species produce an abundance of lint which is sometimes used by the natives. These plants are almost invariably found growing in door-yards where they have been planted for shade or ornamental purposes, or growing in locations where it is apparent that they are to be regarded in a sense as escaped from cultivation.[5] These lint producing wild cottons are very likely to have been introduced in prehistoric times from the south but it seems unlikely that the cotton Bucculatrix was introduced from this direction for these insects would rarely if ever be carried with seed and, furthermore, if the species were introduced it would be almost certain to have been first established in southern Sinaloa and Nayarit where it appears to be absent on both wild and cultivated cottons.

Distribution

The cotton Bucculatrix occurs throughout central and northern Sinaloa, Mexico, and as far north as Guaymas, Sonora. It was not found in the Altar valley of northwestern Sonora in September, 1925, in the course of a cotton pest survey of that district. It has not been found in the extreme southern Sinaloa, in the state of Nayarit or in the vicinity

[5] *G. morrilli*, recently described by Cook and Hubbard (Proc. Wash. Acad. Sciences Vol. 16 p. 339, 1926) may be an exception as the seed from which the type plants were grown was obtained from plants growing in uninhabited districts on the Sonora coast.

of Torreon, state of Durango. The locations where the species has so far been discovered are as follows: Guaymas, Cocorit and Cajeme, state of Sonora, Los Mochis, Cachuana, Guasave and Navolato, state of Sinaloa. All of these localities are less than 100 feet above sea level.

Observations on Life History and Habits

Adult Activity. The adult of *B. gossypiella* shows no activity during daylight unless disturbed when it flies only a few feet at the most. Slight activity is shown at dusk while the greatest activity is at night. On November 17, 1926, near Cajeme, Sonora, the writer made special observations on adult activity. No adults were seen during daylight in one-half hour's search for active moths. Immediately after sundown two adults were noted crawling on cotton leaves during a ten minute search, while after the twilight period a ten minute search with a flashlight in the same location resulted in finding eight specimens actively crawling on leaves and other parts of the cotton plants. None of the moths have been observed at lights in houses located near infested cotton fields, in one case within 100 feet, and no attraction to lights was shown in connection with the above mentioned use of flashlight in a cotton field.

Place of Egg Deposition. Eggs of *B. gossypiella* are deposited on nearly all exposed parts of the cotton plant. The tops of the leaves in the angles formed by veins at junctions with leaf petioles and the carpels of green bolls are about equal in rank as preferred locations. New woody branches up to ½ inch in diameter follow closely in order. When the insect is present in abundance, scattering eggs may be found generally on leaf blades, on petioles of leaves and on pedicels of squares and bolls, on involucral bracts and on the buds. When abundant, numerous eggs can be found on practically every leaf except perhaps those located low down on the plants. The examination of a random collection of 60 more than half grown green bolls in one instance gave an average of 9.9 eggs per boll ranging from 0 to 32. In one other instance 55 eggs were counted on one green boll. A 12 inch section of a shoot of an Egyptian cotton plant ¾ inch in diameter at the base and tapering to ¼ inch, representing a typical condition, was found to have a total of 36 eggs scattered from one end to the other. In contrast with these observations it should be noted that the eggs of *Bucculatrix thurberiella* are scattered at random on the leaf blades with only an occasional one found on the involucral bracts and calyx.

Feeding Habits of Larvae. The larvae enter the plant tissue directly from the egg and the empty shell remains covering the en-

trance hole. If it finds itself in a leaf blade the larva circles around the point of entrance for a short time then makes its way along a branch vein to a large vein or to the junction of the leaf blade and leaf petiole. Occasionally a blotch like or trumpet shaped mine is produced in the leaf tissue but never, so far as observed, a clear cut serpentine leaf mine similar to that made by *B. thurberiella*. Although observations to date are not conclusive, it appears that the majority of the worms which begin their larval development in parts of the plant other than in bolls and buds come to the surface at the end of the second larval stage. This is supported by the fact that the exit holes from such parts, as shown by measurements of 10 representative ones, average about .36 mm., ranging from .3–.6 mm., whereas in the case of bolls from which only full grown larvae are known to emerge similar measurements gave an average of .8 mm. with a range of .75 to .87 mm. An unusually small exit hole in the carpel of a boll discovered in one other instance measured .33 mm., indicating a possible exception to the rule in the emergence of a second stage larva. After emerging from the interior the worm feeds on the leaf externally very much as does *B. thurberiella*, but a preference for the outer margins is shown and most of this feeding is on the leaves occurring low on the plant. In this respect *B. gossypiella* resembles the apple Bucculatrix (*B. pomifoliella* Clemens).[6]

The larvae which enter the carpels of the bolls find the most favorable conditions for their development and as already stated complete their larval growth before coming to the surface. Fortunately the larvae in the carpels do not penetrate the inner wall into the interior of the boll. At first they circle around near the point of entrance and then wander away for some distance eating a gradually enlarging irregular tunnel of the blotch type. Moulted head shields of two sizes have been found in the frass in such tunnels. In ten instances the distances from the entrance holes to the emergence holes in carpels of bolls ranged from 1 to 5.5 mm. averaging 3.1 mm. An exceptional instance was noted where the distance was 7 mm.

The larvae in the stem prefer to feed in the succulent parts just outside of the woody tissue but frequently penetrate woody stems to the pith. In one instance a live last stage larva emerged from a lot of woody cuttings ranging from 3/16 to 6/16 inches in diameter and although stunted in size developed into a perfect adult.

Molting Cocoons and Pupating Cocoons. Those larvae which emerge from their burrows at the end of the second stage spin molting

[6]Bul. 213 Cornell Exp. Sta. p. 73.

cocoons closely resembling those made by *B. thurberiella* and *B. pomifoliella*. These molting cocoons are commonly found on stems, usually in depressions or in scars left by fallen leaves, squares or bolls, comparatively few occurring on leaves. Two typical molting cocoons measured 3 by 1.6 mm. and 4 by 2 mm. respectively. The pupating cocoons are in general form typical of the genus Bucculatrix but the method of construction has not been observed.

The pupating cocoons are very difficult to find even on plants heavily infested with the larvae. On October 16 in an effort to secure more definite information in regard to the locations preferred by the larvae for spinning cocoons, an examination was made of 10 dry leaves picked from the ground under heavily infested plants, 10 mature green leaves, 10 immature green leaves and 10 green bolls from lower branches. On the dry leaves 10 molting cocoons and two pupating cocoons were found, seven molting cocoons were found on each lot of green leaves and no pupating cocoons, while on the green bolls only two molting cocoons were found. In a later examination in the same cotton field 3 pupating cocoons were found on one dry leaf. No pupating cocoons were found on the cotton stalks in a special search of 5 minutes, and none were found in crevices in the ground.

The "palisades"[7] or upright threads placed by the larva in an ellipse surrounding the place selected for constructing the pupating cocoon numbered, in four instances, 30, 31, 32 and 33 respectively.

Character and Amount of Injury

Wherever the newly hatched larva enters the plant tissue it first feeds close to the epidermis and a deep reddish surface spot gradually develops surrounding the entrance hole which is covered by the egg shell. This spot is at first more or less circular in outline but as it enlarges it becomes more irregular. Infested leaves show these discolored areas along the veins and as blotches on the leaf blade. The spots on the stems are usually more or less elongated longitudinally with the stem. Where two or more eggs are deposited close together the spots coalesce and in the case of the boll when three eggs are deposited within a radius of 1/8 inch the feeding of the three larvae usually results in the drying out and splitting of the carpel in a characteristic manner. Two larvae sometimes cause similar injury.

A normal cotton plant is able to support a large number of larvae of the cotton Bucculatrix without appreciable damage to any parts except

[7]Slingerland and Fletcher, Ibid.

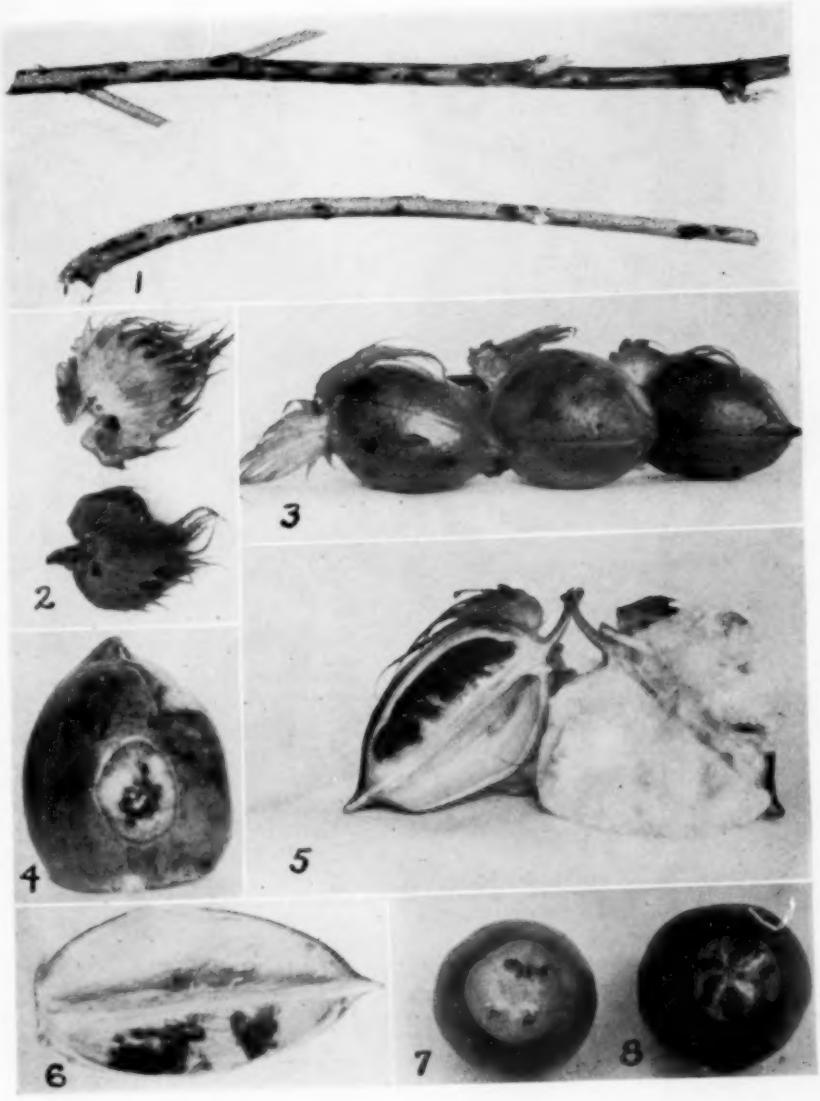
the bolls. The ends of the growing shoots frequently show stunting late in the season as a result of the attack but fortunately the insect does not as far as observed increase to destructive numbers until after the first of September, when such stunting is of little or no importance. The bolls suffer considerable damage but even these parts may support large numbers of the larvae without appreciable effect. On the other hand the attack by as few as five larvae at the tip of a young boll may cause its complete destruction. The following data show the results recorded in one instance in the Yaqui Valley where an examination was made of 20 green bolls all larger than ¾ inch in diameter picked at random:

Condition	No. of bolls	Aver. No. of worms	Largest No. of worms	Smallest No. of worms
Practically uninjured	8	6.3	11	4
Lint slightly stained	7	10.5	27	6
Lint badly stained	5	13.3	24	5

The average number of worms per boll for the 20 examined was 10.4. Fortunately the slight staining of the lint, which may cause a cotton grower much apprehension as to the extent of the damage, usually disappears soon after the bolls open. Direct sunlight hastens the bleaching-out process. It is only those bolls which are classed as badly stained and those which are so severely damaged they do not open normally that represent a loss. Some of those which appear to be badly stained are not necessarily a complete loss, as for instance when one lock in four is damaged in this way and the other locks open normally. The lot of 20 bolls referred to in the table did not include any of the partially opened and deformed bolls such as shown in Plate 15 which constituted not less than 10 per cent of all the bolls present in the field at the time. The total loss in this instance was estimated at approximately 35 per cent.

The damage from the cotton Bucculatrix in the Yaqui Valley is usually between 10 and 30 per cent. The damage may be held to the minimum under the prevailing conditions it is believed, by avoiding too early planting which gives the insect an opportunity to establish itself in the field and multiply early in the season before climatic conditions are favorable for the development of the cotton plant. In that locality April and May appear to be more favorable for cotton planting than February or March from the standpoint of control of the two leading cotton pests, the boll weevil (*Anthonomus grandis* Var.)[8] and the cotton Bucculatrix. If future investigations confirm this tentative conclusion

[8] JOUR. ECON. ENT. Vol. 14, pp. 373–374.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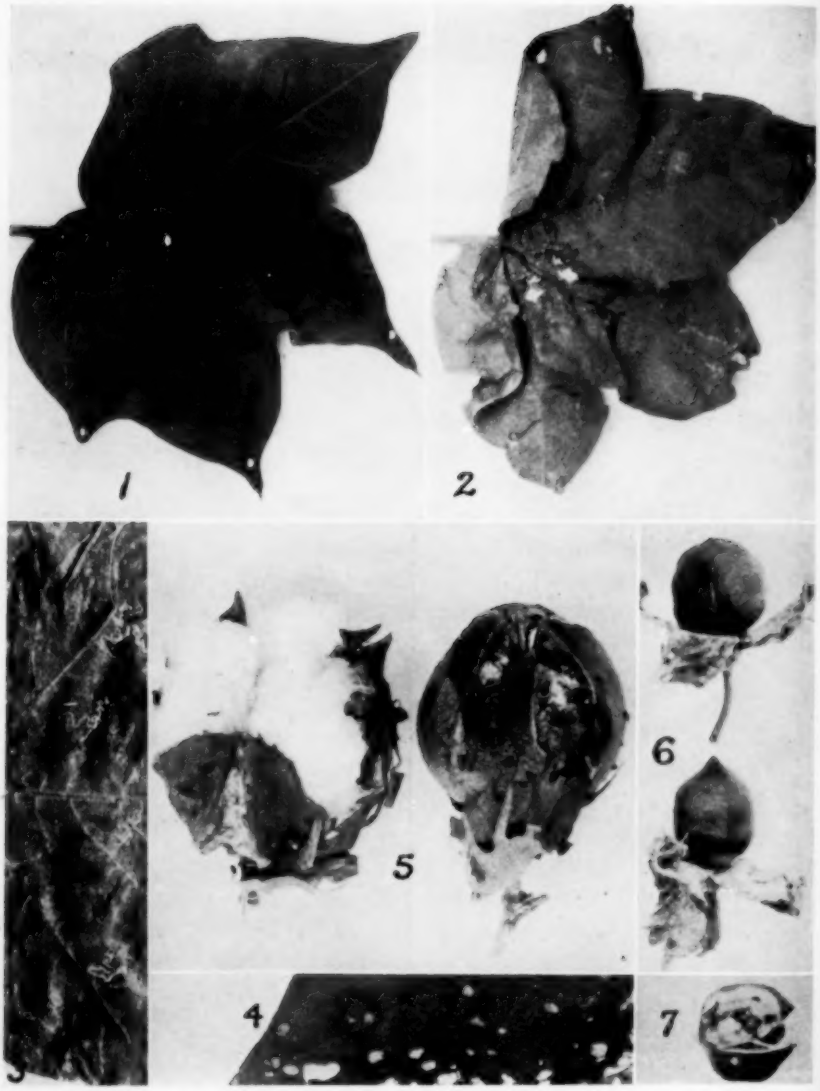
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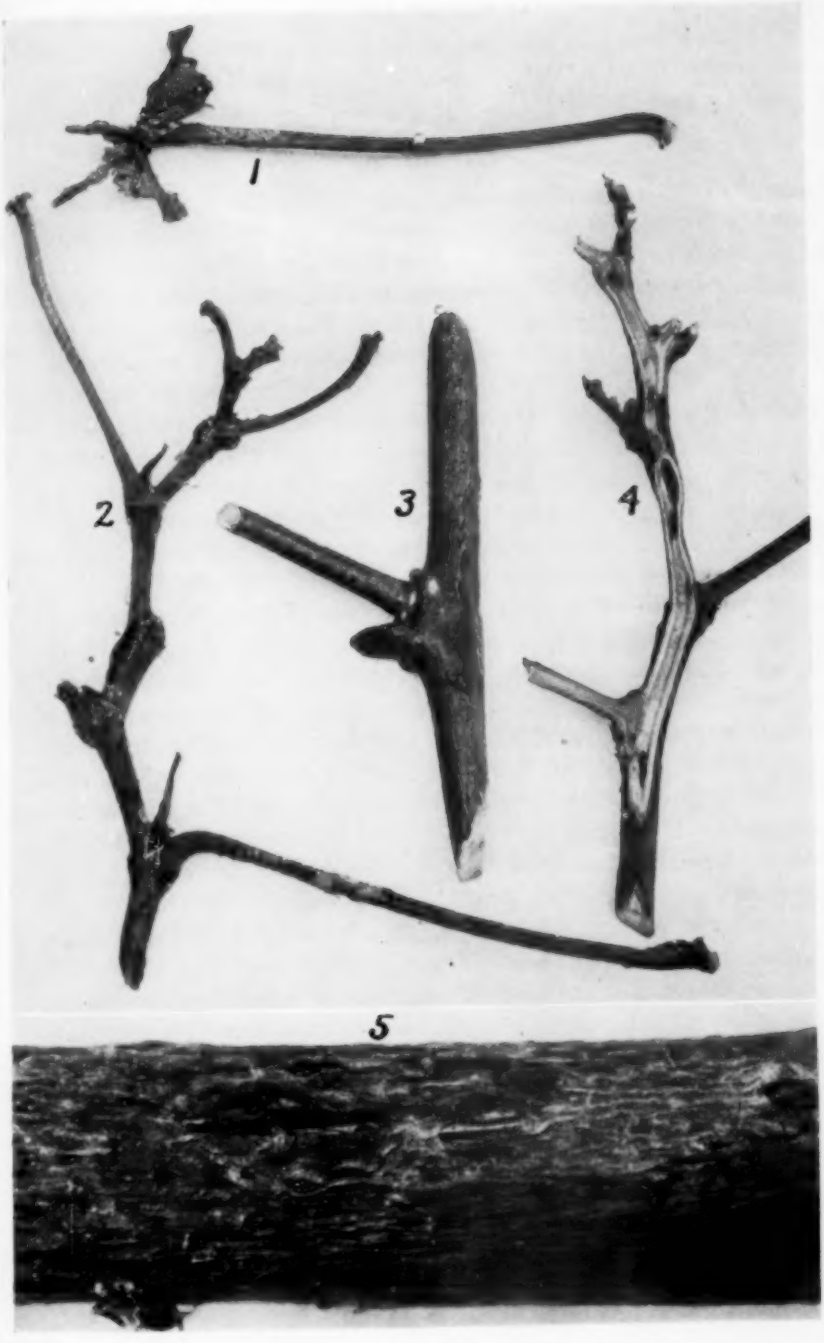
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an effort will be made to secure a government regulation for the protection of the cotton industry prohibiting the planting of cotton before April 15 and requiring the destruction of cotton stalks before January 15 or other specified dates.

Dissemination

As is the case with its relative *B. thurberiella*, the cotton Bucculatrix has shown remarkable ability to spread within its habitat and to find single isolated cotton plants as well as fields of cultivated cotton, even though located several miles from known sources of infestation. In view of the small size and weak flight of the adult, this may indicate the existence of another food plant than cotton but no such plant has as yet been discovered.

Seed cotton may occasionally carry live larvae or pupae from the field to the gin, but it is hardly conceivable that a live Bucculatrix in any stage could survive the ginning process and be carried with cotton seed to an uninfested section. Baled cotton would be even less likely to serve as a conveyance for the pest in a live state.

The northern limit of the cotton Bucculatrix is believed to be the vicinity of Hermosillo in the state of Sonora. If the insect has the same capability for spreading north of this point as it has shown in southern Sonora it should find no difficulty in extending its range 120 miles north to the vicinity of Magdalena where a small acreage of cultivated cotton was grown in 1927. Magdalena is about 50 miles south of the international line and about 70 miles south of the nearest cotton growing district of the United States. Probably no wild cotton of the genus *gossypium* grows perenially within 75 or 100 miles of the international line but the hardy Arizona wild cotton, *Thurberia thespesiodes*, undoubtedly grows in many places in this region, judging from its known distribution north of the international line. Whether or not the Arizona wild cotton is a food plant or may serve as such and the reasons for the limited distribution of the cotton Bucculatrix in northern Sonora are interesting and important problems regarding this species which remain to be solved.

Explanation of Plates

Plate 14. Work of *Bucculatrix gossypiella* Morrill on cotton: 1, Woody cotton twigs infested with larvae; 2, Cotton squares with bracts infested; 3, Bolls with infested carpels, emergence hole of larva shown near tip of boll at right; 4, Tangential section cut off from infested cotton boll showing larval burrows; 5, Infested boll opened to show discoloration of inside of carpel and damaged lint above at right; 6, Inner side of carpel of infested boll showing discoloration due to work of larvae; 7, Infested boll sectioned near base; 8, Infested boll sectioned near tip.

PLATE 15. Work of *Bucculatrix gossypiella* Morrill on cotton: 1, Lightly infested leaf showing mines of blotch type; 2, Heavily infested leaf showing severe damage to main ribs and adjoining parts of leaf blade, also slight damage near outer margins by feeding of larvae on surface; 3, Part of cotton leaf showing typical mines of young larvae of *Bucculatrix thurberiella* Busck; 4, Surface feeding of *B. gossypiella* on cotton leaf; 5, Bolls of cultivated cotton showing typical effects of excessive infestation by *B. gossypiella;* 6, Bolls of *Gossypium davidsonii* with carpels infested, spot with egg shell on boll above, emergence hole shown in boll below; 7, Same with epidermis removed to show burrows inside of carpel.

PLATE 16. Work of *Bucculatrix gossypiella* Morrill on cotton: 1, Dry leaf with all except fragments of blade removed to show damage to end of petiole and to leaf veins; 2, End of cotton branch showing stunted growth and gall-like swellings resulting from heavy infestation of woody parts; 3, Section of cotton stem showing cracked epidermis along course of larval burrow, also showing two moulting cocoons attached near center of figure; 4, End of cotton branch cut to show work of larvae, with burrows penetrating woody tissue to the pith; 5, Infested cotton stem greatly enlarged to show external effects of larval infestation.

Scientific Notes

An Infestation Index for Fruit Pests. The failure to note the relation of a crop infestation as determined on a percentage basis to the actual pest population of the fruit producing area has rendered valueless for criterion purposes the results of many excellent studies on pest control. In the case of the walnut codling moth the crop infestation will show the losses from year to year but it will not show with a similar degree of accuracy the variation of the moth population from year to year. Such yearly variations as well as variations between units or localities during the same year cannot be determined by means of the crop infestation alone. An index of the populations of a cultural unit, however, may be derived from the percentage of crop infestation by multiplying the average yield per acre by the per cent of infested fruit. The number thus obtained would represent the pest population for the unit under consideration. During favorable seasons as in 1925 the average yield of full bearing walnut orchards in the Saticoy district is 2,000 pounds per acre. Last year the average yield dropped down to 800 pounds per acre. If, for example, the moth population in this district for the last two years is represented by the index number 200 then the degree of crop infestation in 1925, would have been ten per cent (10%) and in 1926, twenty-five per cent (25%).

STANLEY E. FLANDERS

The orange maggot, *Anastrepha ludens* Loew, has been found in the principal citrus growing section of Texas. About the first of April a few grapefruits which came from the Lower Rio Grande Valley were found to contain some suspicious looking maggots. From these were reared four females and three males of the fruit fly, *Anastrepha ludens* Loew. Verification of the determination has just been received from Prof. J. M. Aldrich of the U. S. National Museum. In the meantime a brief survey to determine the distribution of the pest has been made. It is apparently well established, maggots being found in old and spoiled fruit of groves at Brownsville, La Feria, Mercedes, Weslaco, Donna, McAllen, and Mission. Practically all of the good fruit had been picked and sold before the presence of the insect was suspected. The only source of material for examination was that found under the trees and this for the most part was in a rotten or decaying condition. Although the orange

maggot is widely distributed in the Lower Rio Grande Valley the presence of the pest has only just begun to be suspected by a few of the growers. Temperatures below freezing are supposed to be very detrimental to this insect, but the past winter was unusually mild. The growers are being advised to thoroughly clean their groves of all fallen or decayed fruit, and to completely burn it with oil or soak it in oil until all maggots which may be present are killed.

F. L. THOMAS

Non-arsenicals for Grasshopper Control. Dusting with non-arsenicals for grasshopper control was tried out at the Sacramento field station, Sacramento, California, in 1926, with caged grasshoppers of the second and third instars. Check cages were used in each experiment. All cages were given fresh alfalfa at the beginning of the experiment. Sodium fluoride and sodium fluosilicate were mixed with both hydrated lime and gypsum at the rate of 1–5, 1–10, 1–15 pounds and dusted with a hand duster.

On June 5, with a temperature of 109° F., the following results were obtained.

Exp. No.	Poison	Inert Material	Time of application	No. hoppers used	No. hours before kill	Per cent killed
1	1 lb. Na. fluoride	5 lbs. hydrated lime	10 a. m.	100	3–4	100
2	1 " " "	10 " " "	" "	"	" "	98
3	1 " " "	15 " " "	" "	"	" "	96
4	1 " " "	5 " gypsum	" "	"	" "	100
5	1 " " "	10 " "	" "	"	" "	100
6	1 " " "	15 " "	" "	"	" "	100
7	1 " " fluosilicate	5 " hydrated lime	" "	"	" "	100
8	1 " " "	10 " " "	" "	"	" "	100
9	1 " " "	15 " " "	" "	"	" "	100
10	1 " " "	5 " gypsum	" "	"	" "	100
11	1 " " "	10 " "	" "	"	" "	100
12	1 " " "	15 " "	" "	"	" "	100

As seen from the above table, positive results at all dilutions were obtained by using either of the poisons. However, additional experiments, with temperatures of 89° F. and 96° F., gave negative results.

With the good showing made by these poisons under high temperatures, further experiments will be conducted with the hope of perfecting their use in major field control of Orthoptera.

C. C. WILSON, *U. S. Bureau of Entomology, Sacramento, Calif.*

THE ROCKY MOUNTAIN CONFERENCE OF ENTOMOLOGISTS

The Fifth Annual Meeting of the Rocky Mountain Conference of Entomologists will be held in Pingree Park, August 15 to 20. Pingree Park is a beautiful mountain park about 50 miles west of Fort Collins, at an altitude of 9,000 feet. Besides the regular program, which will be announced a little later, time will be available for collecting under these mountain conditions and for recreation. Part of the program will be in the form of symposiums. Advance information on the attendance makes

the following subjects seem appropriate: "The History of and Recent Developments in Economic Entomology," and "Problems in Apiculture." Transportation from Fort Collins to the Park, and accomodations, including meals, are provided at actual cost. Members of the family are cordially invited. All that have an opportunity to attend are urged to notify the secretary at once. Detailed information as to the arrangements will be sent to all interested.

GEORGE M. LIST, *Secretary, Rocky Mountain Conference of Entomologists, Colorado Agricultural College, Fort Collins, Colorado.*

SPRAY RECOMMENDATIONS FOR CODLING MOTH CONTROL FOR WASHINGTON 1927

Prepared by Representatives of the Washington State Experiment Station, the Federal Bureau of Entomology and the Washington State Department of Agriculture.

1. The severity of codling moth infestation in the state of Washington depends on length of growing season, degree of infestation the previous year and temperature at the time of emergence of the moth. Hence, such infestation varies in intensity in different districts and in different orchards.

2. Within a single district orchards vary in exposure, density of tree growth, type of cultivation, (whether cover crop or clean culture) and type of soil. All of these factors affect the development of the codling moth.

3. Because of these variable factors, specific spray recommendations cannot be given for an entire state or district. The spray program, while based on general principles, must be worked out in detail for each individual orchard.

4. The general principles are here outlined for the guidance of the grower.

(*A*) *Spray Treatment*

1. Arsenate of lead is the only known insecticide that is practical and effective in codling moth control.

2. Oil and other insecticides must be considered either ineffective or in the experimental stage. Do not use them except for experimental purposes.

3. The time of application and number of sprays to be used will vary in different orchards and in different localities and should be determined by each individual grower.

4. Major efforts for codling moth control should be directed toward first brood elimination.

5. The calyx spray should be applied when approximately 80% of the petals are off and before the calyx lobes have closed. Experimental evidence shows that this spray is important and should not be omitted.

6. The cover sprays should be timed carefully by the use of moth traps placed well up in trees away from packing sheds or other buildings. The first cover spray should be completed within ten to twelve days after moths are caught in the traps. If thermometers are available, temperature records should be taken as soon as first moths are caught in traps. If the temperature is 60 degrees at dusk, eggs will be laid and the first cover spray should be on the trees within ten to twelve days.

7. Cover sprays should be applied every ten days in severely infested orchards. In high altitudes or isolated orchards, having light infestation, one or possibly two cover sprays may suffice.

8. Cover sprays for first brood worms can stop ten days after moths practically cease to enter traps. This usually comes five to six weeks after the first moths appear.

9. Second brood sprays:

If there is an average of three to five worms per tree by July 1 or if moth traps show an increase in number of moths caught after July 1, one or more sprays for second brood should be applied.

10. The use of lead arsenate at the rate of 1 lb. to 50 gals. of water is usually sufficient. If a heavier dosage is used, do not use more than 1–½ to 50, and apply only in first and second cover.

11. BE THOROUGH IN SPRAYING, COVER EVERY PORTION OF THE TREE AND GIVE SPECIAL ATTENTION TO THE TREE TOPS, SINCE THAT IS WHERE THE EXTRA FANCY APPLES GROW AND WHERE MOST OF THE EGGS ARE LAID. TIMELINESS AND THOROUGHNESS CANNOT BE OVER-EMPHASIZED.

(B) Supplementary Treatments

1. Destroy all overwintering larvae in warehouses, apple boxes, packing sheds and other buildings. Avoid promiscuous transportation of infested apple boxes from one orchard to another.

2. Scrape rough bark from trees and burn to destroy overwintering larvae hibernating under the bark. This should be done to a depth of one to two inches below the ground.

3. Place moth traps well up in trees just before calyx spray is given, to catch the adult moth. Traps of this kind catch many moths before eggs are laid.

4. Band trees June 1 and examine every ten days. Rough barked trees should be scraped before banding. The bands will catch approximately 45% of the worms that leave the apples.

5. Fruit should be thinned to break clusters and to remove wormy fruit. This should be destroyed and not buried.

EDWARD C. JOHNSON, *Dean of Agriculture and Director Agricultural Experiment Station, State College of Washington, Pullman*

J. I. GRINER, *Supervisor of Horticulture, State Department of Agriculture, Olympia*

GEO. E. HARTER, *District Horticultural Inspector, Wenatchee*

E. J. NEWCOMER, *Assoc. Entomologist in Charge Federal Entomological Laboratory, Yakima*

F. C. NIELSEN, *District Horticultural Inspector, Spokane*

ANTHONY SPULER, *Assoc. Entomologist, Agricultural Experiment Station, W. S. C., Pullman*

R. L. WEBSTER, *Entomologist, Agricultural Experiment Station, W. S. C., Pullman*

(Signed March 12, 1927)

JOURNAL OF ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

JUNE, 1927

The editors will thankfully receive news matter and other items likely to be of interest to our readers. Papers will be published as far as possible in the order of reception, except that papers of reasonable length may be accepted in the discretion of the editor for early publication at $2.50 per page for all matter in excess of six printed pages, a part page counting as a full page, this limit not including acceptable illustrations. Photo-engravings may be obtained by authors at cost.

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CHARLES P. LOUNSBURY, born in New England, gaining his inspiration from the elder Fernald, was graduated from the Massachusetts Agricultural College in 1894 and became Government Entomologist of the Colony of the Cape of Good Hope in July 1895, later becoming the senior official entomologist in South Africa. He has completed thirty-two years of service in the employ of a sister nation and has made a record which commands the admiration and respect of all. We learn through the South African press that he has retired and it is gratifying to note the justly high appreciation in which he is held. When he began, he was the only official entomologist in South Africa, now there are twenty-five in the Union, five in Southern Rhodesia and one in Portuguese East Africa—concrete testimony to the soundness of the work of our friend and colleague. His first work was with the fruit growers and it was through his efforts that adequate quarantine measures were adopted. He demonstrated the rôle of the tick in the transmission of certain animal diseases and the value of arsenite of soda for the destruction of ticks. A pioneer entomologist in that section of the world, he built wisely and well. His American friends deeply regret his retirement and trust that it means a well earned period of comparative ease and pleasure in his adopted country.

Reviews

La Vie des Termites by MAURICE MAETERLINCK, 217 pp., E. Fasquelle, Paris, 1927.

This book aims to do for the termites what the author's celebrated book on bees did for the other form of colonial life. To a considerable degree this has been accomplished, but it is evident that the author has less personal familiarity with termites than he had with his beloved bees. Reference is made to a considerable literature, including things as late as Cleveland's work on the intestinal protozoa. One looks for philosophy in all the writings of Maeterlinck, and in this book again appears his speculations on the government of colonial insects. In the years that have intervened since he wrote his bee book, the author seems to have found it less possible to settle these problems offhand. It is greatly to be hoped that an English translation will soon make this book more generally accessible.

E. F. PHILLIPS

The Ant People by HANS HEINZ EWERS, 323 pp., illustrated, Dodd Mead and Co., New York, 1927. Translated from German by C. H. Levy.

This is a popular book purporting to put information about the ants into such form that the layman can understand it. The burden of the book is a denunciation of the "pedantic scientists" who refuse to write so that ordinary humans can understand them. The author claims to have "poked his nose into ant nests in every land," but there is considerable evidence that most of his poking has been among the writings of those whom he so delights to belittle. His personal observations appear to be insignificant and superficial. The book will amuse entomologists, except possibly those who specialize in ants. It would appear that the author had in mind to do for ants what Maeterlinck has done for bees and termites: if this were his ambition he failed. The English translation is illustrated from the works of the derided pedantic scientists, some of them being used with amusing error.

E. F. PHILLIPS

Current Notes

Mr. J. G. Sanders of Philadelphia visited New Haven, Conn., and Providence, R. I., on May 8.

In March a shipment of 20,000 Tiphia cocoons from Assam, India, arrived at the Japanese Beetle Laboratory, Riverton, N. J.

Professor William Lochhead, Professor Emeritus of Entomology and Zoology, MacDonald College, McGill University, died March 26, in the sixty-third year of his age.

Mr. H. F. Barnes, research scholar of the Ministry of Agriculture, London, England, visited the Gipsy Moth Laboratory at Melrose Highlands, Mass., on February 8.

Mr. H. C. Hallock, of the Japanese Beetle Laboratory staff, recently spent three days at the U. S. National Museum studying Muscoid flies with Dr. J. M. Aldrich.

Mr. L. W. Brannon, Bureau of Entomology, returned to Birmingham, Ala., March 16, from his temporary assignment with the Federal Horticultural Board, scouting for the pink bollworm.

Dr. W. R. Thompson and Mr. K. W. Babcock plan to leave shortly for Paris to confer with American agricultural officials in regard to the European corn borer.

Mr. W. N. Keenan, of the Entomological Branch, delivered an address on "The Warfare against Foreign Insect Pests," over the radio from station CNRO, Ottawa, on February 21.

Professor George A. Dean, Manhattan, Kansas, will serve as consulting entomologist for the newly formed Millers' Export Inspection Bureau, an organization to insure flour from insect infestation.

For the present, Mr. L. H. Worthley will be located in Toledo, Ohio, with headquarters at 615 Front Street, in charge of control operations against the European corn borer.

Dr. Philip Garman gave an illustrated address on April 5, before the New York Entomological Society, on the work of the Entomological Department of the Connecticut Agricultural Experiment Station.

Mr. Neale F. Howard of the Bureau of Entomology, and Dr. D. M. De Long, Professor of Entomology, Ohio State University, recently visited the southeastern United States to study bean insects.

Messrs. R. W. Moreland, V. V. Williams, W. A. Stevenson, G. L. Smith and G. L. Garrison of the Arizona weevil force at Tucson, Ariz., have recently been transferred temporarily to the Federal Horticultural Board.

Dr. F. H. Lathrop and Mr. C. B. Nickels, of the Bureau of Entomology, have returned to Cherryfield, Maine, to resume the blueberry maggot investigations, after spending the winter in Washington, D. C.

On February 16, Mr. E. R. Van Leeuwen addressed the Century Club of Philadelphia, and on March 2, the Rotary Club of Rahway, N. J., on "Control Measures for the Japanese Beetle."

Dr. Grace H. Griswold of Cornell University visited at New London, Conn., for a few days early in April and called at the Agricultural Experiment Station, New Haven, on April 6.

At a meeting of the Eastern Plant Board held in New York City, May 2, the following entomologists were present: T. J. Headlee, E. N. Cory, W. C. O'Kane, W. E. Britton, R. H. Allen, L. B. Smith, and C. C. Hamilton.

Dr. Henry Fox, Japanese Beetle Laboratory, Riverton, N. J., visited the Boyce-Thompson Institute, Yonkers, N. Y., in February to inspect equipment and to consult with specialists in regard to contemplated lines of investigation.

Mr. L. S. McLaine, Entomological Branch, gave an address on "The Biological Control of the Spiny Cactus in Australia," before members of the Entomologists' group of the Professional Institute at Ottawa, on April 7.

According to *Science*, Dr. C. Montague Cooke, Jr., has been appointed chairman of the directing committee which has recently been organized in Honolulu to make an entomological survey of the countries bordering on the Pacific.

Dr. Philip Luginbill and Mr. Blanchard of the Monroe, Mich., laboratory, visited the Chatham, Ont., laboratory recently, to secure breeding stock of the corn borer parasite *Exoristes* and to observe the technique followed in rearing this species.

Mr. F. W. Poos, entomologist of the Virginia Truck Experiment Station, Norfolk, Va., visited the Bureau of Entomology, Washington, on March 16 to discuss studies on the potato tuber moth which he is conducting for the State of Virginia.

Professor Roger C. Smith was awarded $300.00 by the National Academy of Sciences for the study this summer of Neuroptera types in the Museum of Comparative Zoology at Harvard University.

Dr. George G. Atwood, Director, Bureau of Plant Industry, State Department of Agriculture, Albany, N. Y., reached the maximum age of retirement March 31, and his assistant, Mr. B. D. Van Buren, has been appointed to succeed him as Director.

Mr. L. F. Steiner, who recently received his master's degree from Ohio State University, has joined the Department of Entomology of the Purdue Agricultural Experiment Station and will undertake an investigation of the codling moth in southern Indiana.

Science announces that the one thousandth meeting of the Jugatae, the entomological society of Cornell University, will be held on May 28, and a celebration is planned to which all of its old members have been invited.

Mr. A. G. Dustan of the Entomological Branch broadcast an address on "The Control of Insects by Disease," from radio station CNRO, Ottawa, on March 7, as part of a program prepared by the Professional Institute of Civil Service.

Mr. J. L. King, on April 14, and Messrs. L. B. Smith and C. W. Stockwell on April 25, visited New Haven, Conn., to confer with W. L. Slate and W. E. Britton regarding proposed work on the Asiatic beetle and the Japanese beetle.

According to *Science*, Professor A. L. Melander of the City College of New York has been appointed to the staff of the Biological Laboratory at Cold Spring Harbor for the coming summer to aid in the course in field zoology.

Dr. L. B. Soliman of the Plant Protection Section, Ministry of Agriculture, Cairo, Egypt, has recently visited the United States, and in February conferred with Dr. P. W. Mason on aphid problems. Dr. Soliman intends to study the aphid fauna of Egypt.

Professor Mario Bezzi, the authority on Diptera of the world, who was recently appointed Professor of Zoology and Director of the Zoological Museum of the Royal University of Turin, Italy, died suddenly, January 14, at the age of fifty-nine.

On February 11, at Albany, N. Y., Messrs. A. F. Burgess, S. S. Crossman, and H. L. Blaisdell attended a meeting called by H. L. McIntyre, of the New York State Conservation Commission, to consider plans for the coming season in the gipsy moth campaign.

Mr. G. A. Ficht, who has pursued graduate work at the Iowa Agricultural College, Ames, Iowa, has recently joined the Department of Entomology of the Purdue Agricultural Experiment Station, Lafayette, Ind., and will be engaged in research on the European corn borer.

Mr. J. N. Knull, of the Bureau of Plant Industry, Harrisburg, Pa., visited the Section of Insects, U. S. National Museum, on March 29 and 30, and examined types of Buprestidae and Cerambycidae in the collection, especially the species which were described by Casey.

According to *Science*, Dr. L. O. Howard has been elected an honorary member of the New York Entomological Society in recognition of his many and great services to entomology, especially as Chief of the Bureau of Entomology of the U. S. Department of Agriculture.

Mr. Norman Criddle gave an illustrated address on "Wild Life in Manitoba" before a meeting of the Entomologists' Group of the Professional Institute, at the home of Mr. H. G. Crawford, on March 9. Mr. Criddle left Ottawa on March 10 to return to Treesbank, Manitoba.

Mr. K. E. Stewart, M.Sc. (McGill) has been appointed to the position of Junior Entomologist, Entomological Branch, to study shade and forest tree insects in the Prairie Provinces. Mr. Stewart, who is at present in Ottawa, will shortly proceed to his headquarters at Indian Head, Sask.

Dr. E. A. Back, Bureau of Entomology, spent February 23 in Hartford, Conn., consulting with a large brush-manufacturing concern regarding its insect problems. Every firm which makes brushes and deals with bristles imported from China is confronted at times with serious problems of that kind.

Mr. C. H. Hadley, Director, Bureau of Plant Industry, State Department of Agriculture, Harrisburg, Pa., resigned, effective May 1, and has accepted a position in the Bureau of Entomology and will be engaged in European corn borer control work with headquarters at 615 Front St., Toledo, Ohio.

Mr. G. M. Stirrett, of the Chatham, Ont., Laboratory, Entomological Branch, visited Arlington, Mass., Silver Creek, N. Y., Wooster, Sandusky, and Oak Harbor, Ohio, and Monroe, Mich., from March 10 to 20, in connection with a careful study of the conduct of European corn borer investigations in the United States.

Mr. H. G. Crawford addressed the Quinte Seed Growers' Association at Belleville, Ont., on March 19, and farmers' meetings at Dundee, Elgin, Hinchinbrook, Franklin, Huntingdon, Havelock, and Hemmingford, Que., during the last week in March, on the European corn borer, in connection with the control campaign against this insect.

Mr. M. B. Dunn, Entomological Branch, arrived in Ottawa from Welcome Lake, Ont., on April 7, after having spent the winter months in the forest carrying out a study of the growth rings of spruce and balsam to determine the loss of annual increment due to recent budworm injuries.

Mr. A. B. Baird, of the Chatham, Ont., Laboratory, Entomological Branch, visited the United States Corn Borer Laboratory at Arlington, Mass., March 29 to April 1, to secure a supply of new parasite breeding material, made available for liberation in Canada by the kind coöperation of the United States authorities.

According to *Science*, at the invitation of the American Association of Economic Entomologists and the Entomological Society of America, the fourth International Congress of Entomology will be held at Ithaca, N. Y., probably the third week of August, 1928. A preliminary program will be issued in the near future.

Dr. Stanislaw Minkiewicz, of the Institute of Agricultural Research, Pulawy, Poland, is spending several weeks in the Division of Insects, U. S. National Museum, looking over various groups of insects that are injurious to Polish crops. He is also interested in methods of handling collections and keeping track of literature.

Mr. Arthur Gibson, Dominion Entomologist of Canada, visited the Japanese Beetle Laboratory at Riverton, N. J., in February, where he spent two days in conference with members of the laboratory staff. Previous to his stop at Riverton, Dr. Gibson attended the meeting of the New Jersey Mosquito Extermination Association at Atlantic City.

Mr. W. H. White, of the Bureau of Entomology, recently visited Sanford, Fla., to discuss the celery leaf-tyer investigations with Messrs. Ball, Boyden and Stone, and returning to Washington, conferred with Messrs. Thomas and Reid at Chadbourn, N. C., regarding work in progress on the strawberry weevil and the seed corn maggot.

Dr. E. A. Chapin, of the U. S. National Museum, spent March 3, 4, and 5 in Philadelphia, studying types of Coleoptera, especially those belonging to the genus *Ptilodactyla*. Since his return to Washington he has completed a short paper on *Ptilodactyla*, describing new species, one of which is injurious to roses in greenhouses.

Mr. P. W. Fattig, curator of the museum of Emory University, Atlanta, Ga., recently spent a week in Washington, consulting with the specialists in the Section of Insects, U. S. National Museum, getting many specimens of insects determined, and arranging to send other specimens as a gift to the Museum collection and for determination.

Professor W. C. O'Kane visited New York City April 2, and also was the chief speaker at a meeting of the Connecticut Branch of the Alumni Association of the University of New Hampshire at Bridgeport in the evening. Dr. W. E. Britton is President, and Professor J. A. Manter, Secretary-Treasurer, of the Connecticut Branch.

Shipments from Europe to the United States of parasites and parasitized larvae of *Pyrausta nubilalis* are steadily being made. For the present fiscal year to date, shipments have been as follows: *Eulimneria crassifemur*, 29,534; *Angitia punctoria*, 11,209; *Phaeogenes planifrons*, 17,017; *Microgaster tibialis*, 127,680; *Masicera senilis*, 1,652; parasitized larvae bearing various percentages of other species, 1,242,000.

The appointment of Mr. Arthur Gibson as Honorary Curator of Entomology in the National Museum of Canada, has been approved by the Hon. Charles Stewart, Minister of the Interior, and the Hon. W. R. Motherwell, Minister of Agriculture. This position and its duties will be additional to his position and duties as Dominion Entomologist in the Department of Agriculture.

Dr. F. C. Craighead returned to Washington February 23 from a trip to the Forest Insect Field Station at Palo Alto, Calif., where a conference was held February 9–16 on the control of forest insects in the West. In March Dr. Craighead visited Florida, Georgia, and North Carolina, to review the work of his division concerning the insects attacking pines in the Southern States.

Mr. Louis A. Stearns, Assistant Entomologist, New Jersey Agricultural Experiment Station, New Brunswick, resigned May 1 to accept a similar position with

the Ohio Agricultural Experiment Station, Wooster. He is located for the present at 713 Center Street, Ironton, Ohio, in charge of a recently established Fruit Insect Laboratory where investigations of the Oriental Peach Moth and Codling Moth will be conducted.

Mr. K. M. King of the Entomological Branch addressed meetings of Weed Inspectors at Saskatoon and Regina on March 1 and 15 respectively, and members of the Case Threshing Machine Company at Saskatoon on March 10, in connection with problems relating to insect pests. On March 15 he broadcast an address on "The Western Wheat-Stem Sawfly," from radio station CKCK, under the auspices of the Saskatchewan Farmers' Radio Farm School.

Dr. E. A. Schwarz has received several long letters from R. C. Shannon, giving an account of a collecting trip taken by Mr. Shannon and Dr. F. W. Edwards, of the British Museum, and their wives. They went into the southern part of the Andes, crossing into Chile and returning by rail to Buenos Aires. They report a very successful collecting trip, in the course of which they found many new species.

Mr. W. A. Ross, of the Vineland, Ont. Laboratory, Entomological Branch, who returned from a visit to Great Britain on February 8, visited a number of laboratories of entomology and plant pathology, and certain important fruit-growing districts in England and Scotland, during his brief sojourn there. During the course of these visits he had the opportunity of meeting many distinguished investigators and made a number of interesting and valuable observations.

Mr. W. Downes left Ottawa to return to Victoria on March 2. While at headquarters he visited Montreal and Quebec, February 12–18, to examine the collection of Hemiptera in the Redpath Museum, McGill University, the George A. Moore Collection, and the Provancher Collection at the Quebec Parliament Buildings. En route to Victoria, Mr. Downes spent several days with Dr. Carl J. Drake of the Department of Entomology, Iowa State College, in connection with Hemiptera studies.

Mr. J. E. Graf, of the Bureau of Entomology, left Washington on February 3 to attend a conference in connection with the sugar-beet leafhopper problem at Ogden, Utah, February 9 to 10. From here he proceeded to the Pacific Coast, where he conferred with State officials and officials in charge of Bureau laboratories and returned to Washington March 14, via the South, after visiting a few of the Gulf Coast laboratories.

Dr. H. E. Ewing left March 16 for a trip to Texas, Arizona, New Mexico and Louisiana, to make field observations on scorpions. He hopes to determine some means of controlling the species which frequent dwellings, and to obtain material for the Museum collection. In Louisiana he hopes to obtain specimens of adult chiggers, so as to continue his experiments on their life history and habits, and plans to return to Washington early in May.

Mr. F. Nevermann, of Costa Rica, spent three days of the week of March 21 in Washington. While there he became acquainted with the various specialists in the Taxonomic Division, U. S. National Museum, examined the collections, and consulted about specimens which he had forwarded. Mr. Nevermann is a very good field observer, and has sent to the specialists interesting specimens of Coleoptera, and many ants and termites. He has a large collection of Costa Rican Coleoptera, which numbers about 5,000 species.

A series of lectures has been planned by the Graduate School Committee of the U. S. Department of Agriculture in order to foster a better acquaintance among the department personnel with the important phases of the work being done in the several bureaus. The first lecture in this series was an illustrated one by Dr. L. O. Howard on "Fifty Years of Economic Entomology," and was given on the evening of March 29, in the auditorium of the U. S. National Museum.

During December last Dr. A. C. Baker of the Bureau of Entomology went to Sacramento, Calif., as consultant on the citrus white fly campaigns contemplated in that State. After a method of procedure had been decided on, he visited the citrus regions in Southern California, and conferred with entomologists of various California institutions. Returning by the southern route, he spent some time at the laboratories in New Orleans and Orlando in order to review the projects under investigation, and reached Washington early in March.

Dr. J. M. Swaine has made arrangements for the transference of parasites of the larch sawfly from Manitoba to eastern Canada. It is also planned to collect and transfer *Phytodietes* parasites from spruce budworm outbreak areas in British Columbia to localities where there are similar outbreaks in Ontario and Cape Breton Island. The parasites will first be sent to Mr. A. B. Baird of the parasite laboratory at Chatham, Ont., before final distribution at various points in eastern Canada. Mr. Norman Criddle has undertaken to collect the larch sawfly parasites in Manitoba.

An artistically and effectively arranged exhibit showing the organization, functions, and work of the Entomological Branch was prepared under the direction of Mr. C. B. Hutchings in the Victoria Memorial Museum, Ottawa, during the latter part of March, at the request of the Deputy Minister of Mines. This exhibit formed part of an extensive exhibition demonstrating the activities of various departments of the Federal Government, and was opened on March 23, on the occasion of the annual Conversazione of the Professional Institute of the Civil Service. It was later thrown open to the general public and attracted more than 11,000 visitors.

The nineteenth annual meeting of the Quebec Society for the Protection of Plants was held at Macdonald College, Que., on March 30. The following papers were presented at the meeting by officers of the Entomological Branch: "The European Corn Borer Situation in Ontario and Quebec," by L. S. McLaine; "Notes on the Control of the Forest Tent Caterpillar," by J. J. de Gryse; "Notes on Some Barriers Used against Garden Slugs," by A. G. Dustan; and "The Household Mosquito, *Culex pipiens* L., and Its Control at Montreal," by C. R. Twinn and W. St. G. Ryan. In addition to the above officers, Messrs. C. E. Petch and W. J. Brown also attended the meeting.

Mr. R. T. Webber visited Washington during the week of February 7 and attended to various details in arranging for his foreign investigations. He sailed on the S. S. George Washington on February 19 for Cherbourg, France. After consultation with entomologists and government officials in France and several other European countries he will proceed to Hungary, to spend a short time with C. F. W. Muesebeck and R. C. Brown, at the Gipsy Moth Laboratory in Budapest, arranging to obtain parasites in Hungary for shipment to Melrose Highlands, Mass. He will then investigate the gipsy moth conditions in Italy, northern France, and Spain, for the purpose of sending natural enemies of this insect to the United States.

A corn borer train consisting of two cars was fitted up and run over the Pennsylvania Lines in northern Indiana from March 28 to April 9. A baggage car carried exhibits dealing with the life history of the European corn borer, and important methods of control. The second car was a passenger coach where motion pictures and illustrated lectures were given. Mr. G. A. Ficht accompanied the train throughout the trip and Prof. J. J. Davis was aboard for the first two days. This train, possibly the first exclusive insect train ever run, was operated by the Purdue Agricultural Experiment Station with the coöperation and assistance of the Pennsylvania Railroad Company, and aroused much interest.

Mr. T. E. Holloway attended the meetings of the International Society of Sugar Cane Technologists, held in Havana, Cuba, during the week of March 14. At the end of the meetings he visited the Cuba Sugar Club Experiment Station, which is under the auspices of the Tropical Plant Research Foundation, and conferred with D. L. Van Dine, Director, and C. F. Stahl and H. K. Plank, entomologists. The main station is at Baragua, but special attention was paid to the work being conducted by Mr. Plank at Jaronu on the control of the sugar cane moth borer. For most of the travel in Cuba advantage was taken of a special train provided by the Cuban Government to afford the delegates a tour of the island.

Messrs. T. R. Gardner and H. A. Jaynes visited Washington, February 15 to 19, where they conferred with Dr. A. L. Quaintance regarding the work of the Bureau in the Orient relative to parasites of the Japanese beetle. Mr. Gardner recently returned from Japan, where for three years he had carried on investigations relating to parasites of the Japanese beetle, and had shipped many parasites of that insect to the laboratory at Riverton. On April 5 he returned to Japan to resume this work for another period of three years. Mr. Jaynes has also recently returned from foreign service, having spent the last three years in China engaged in work on parasites of the Japanese beetle. On his trip back to this country he stopped for two weeks in England, where he examined type specimens of some of the parasitic wasps at the British Museum.

In the collection of the California Academy of Sciences, reports Dr. H. E. Burke, of the Palo Alto Forest Insect Field Station of the Bureau of Entomology, there are several specimens of the wood-boring beetle, *Trachykele opulenta* Fall., which were taken from a 1,200-year-old lightning scar in the wood of a "big tree," *Sequoia washingtoniana*. These specimens, says Dr. Burke, were collected at Giant Forest in the Sequoia National Park in California. When the tree was about 420 years old it was struck by lightning. The wood-boring beetle attacked the scar, and a brood developed in the wood. Some of the beetles failed to emerge and were hermetically sealed as new growth covered the scar. The beetles remained in perfect condition in the wood of the tree for 1,200 years, until the entomologist came across them. Careful comparison of these ancient specimens with modern specimens of the same species shows that there has been no material change in the species in the 1,200 years.

The third annual meeting of the Kansas Entomological Society was held at Lawrence, Kansas, April 14, 1927, with twenty-two members present. The day was spent in the presentation of papers and reports concerning research work in progress. Steps were taken to secure the publication of the proceedings of the society. A resolution was passed that the Society go on record as favoring a uniform building code in Kansas that will prevent termite injury. The meeting of the Society next year will be held in Wichita, Kansas, at about the time of the meeting of the

Kansas Academy of Science. New officers elected were Mr. Warren Knaus of McPherson, President; Dr. R. L. Parker, Manhattan, Secretary. The following were present: Professor Geo. A. Dean, Dr. Roger C.Smith, Professor J. W. McColloch, Dr. R. L. Parker, Professor Harry R. Bryson and Dr. Reginald H. Painter, Manhattan; Dr. Hazel E. Branch, Wichita; Mr. Lyle A. Stephenson and Mr. and Mrs. J. W. Blachly, Kansas City, Mo.; Mr. W. Knaus, McPherson; Mr. J. R. Horton, Mr. Warwick Benedict, Miss Kathleen Doering, Dr. H. B. Hungerford, Dr. Paul B. Lawson, Professor R. H. Beamer, Dr. P. A. Readio, Mr. Howard Deay, Mr. Charles H. Martin and Mr. E. P. Breakey, Lawrence, and Mr. Schenk, American Cyanamid Sales Company, New York.

The Boll Weevil Field Station of the U. S. Bureau of Entomology at Tallulah, La., was completely inundated in the great Mississippi flood. This is the headquarters for the Bureau's cotton insect investigations for the South and the Southwest, and includes five buildings. Water invaded the photographic laboratory and rose to within a few inches of the main floor of the office building. The aviation field of the station, some two miles northeast of Tallulah was all under water. This is the headquarters for all of the flying equipment used by the Bureau in all its crop dusting work in the South. The four planes were removed just in advance of the flood. The hangar is still standing though windows were broken by the rushing water. There does not appear to have been any great amount of damage to government property, though personal losses of the 20 station people may be considerable. The boll weevil experimental work will be delayed and certain phases made impossible this season. Communication with Tallulah was interrupted by the flood and its reestablishment is a matter of some uncertainty.

Horticultural Inspection Notes

Brown-tail moth scouting in Nova Scotia was completed for the season on March 26, a total of 19 nests having been found as compared with 77 found last year.

Mr. A. G. Harley has been transferred from Baltimore, where he has been stationed since June 1925, to Philadelphia, to assist in handling the work of the Federal Horticultural Board at the latter port.

Messrs. Arthur G. Lennox, William A. Ranck, and W. M. J. Ehinger were recently appointed Junior Plant Quarantine Inspectors in the Federal Horticultural Board. Mr. Lennox is stationed in New York, Mr. Ranck in Baltimore, and Mr. Ehinger in Philadelphia.

Mr. W. W. Wood, who has been stationed in New York, was transferred to Detroit about March 21 to take charge of the work of the Federal Horticultural Board at that port and at Port Huron, Mich.

The narcissus bulb quarantine, domestic, has just been revised by the Federal Horticultural Board and regulations (HB No. 203) issued which serve to explain a number of points in connection with the inspection and certification of domestic narcissus bulbs.

Mr. George Becker, in charge of the pink bollworm eradication work for the Federal Horticultural Board, was in Washington for a few days early in May for a conference relative to the progress of the work.

The Federal Horticultural Board has recently established a new station at Hidalgo, Texas, and Mr. J. M. Singleton, who was stationed at El Paso, Texas, was transferred to Hidalgo to take charge of the Board's work at the new port.

On March 9, inspectors of the Federal Horticultural Board found among the effects of a passenger from Barbados arriving on the steamship *Voltaire*, a package containing five pieces of sugar cane, one cassava, and one cotton boll. On examination of this material the cotton boll was found to contain six living larvae of the pink bollworm, *Pectinophora gossypiella*.

Mr. George B. Sudworth, dendrologist of the Forest Service and a member of the Federal Horticultural Board, died at his home in Chevy Chase, D. C., Tuesday, May 10, 1927. Mr. Sudworth was appointed a member of the Board in 1912, at the time of its creation, and had served continuously until the time of his death.

The National Plant Board met in Washington on May 12 and 13 to discuss a number of quarantine matters of importance. A joint meeting was held with the Federal Horticultural Board on the afternoon of May 13. The members of the Plant Board in attendance were Lee A. Strong, Wilmon Newell, W. C. O'Kane, W. A. McCubbin, R. E. McDonnald, S. B. Fracker, and Frank N. Wallace.

Mr. R. K. Beattie, until recently in charge of the Import Division of the Federal Horticultural Board, was transferred on May 1 to the office of Forest Pathology of the Bureau of Plant Industry, to take up work in connection with the securing of varieties of chestnuts immune to the blight disease. He will probably spend a considerable amount of time in the Orient on this work. Mr. Beattie has been connected with the Board since July, 1914, as Pathological Inspector.

The turnip gall weevil, *Ceutorhynchus pleurostigma*, has been recently intercepted by inspectors of the Federal Horticultural Board in two shipments of rutabagas arriving at New York from Holland. The shipments, made up of 3,560 bags, were refused entry and returned after a careful examination which showed that 2.3% of the roots were infested. This insect, which is not established in the United States, is reported to be a rather destructive pest of cabbage, cauliflower, Brussels sprouts, broccoli, turnips, rutabagas, and wild crucifers in Europe.

The West Indian sweet potato weevil, *Euscepes batatae* Waterhouse, has been intercepted recently in sweet potato tubers by inspectors of the Federal Horticultural Board at New Orleans, and Washington, D. C. The tubers intercepted at New Orleans originated in Brazil, while the insects collected in Washington came in tubers from Porto Rico. This insect is widely distributed in the West Indies and is also established in Brazil, Argentina, and in the Hawaiian Islands. Judging from the amount of injury caused in the tubers, this insect might become a serious pest if established in this country. From one small tuber examined, 44 insects were taken, and from another, 25 were removed.

Pacific Slope Notes

Mr. A. O. Larson, of the bean weevil investigations, Alhambra, Calif., spent the month of February in Washington, summarizing notes and reviewing literature.

On February 17, W. D. Reed, of the Dried-Fruit Laboratory, Bureau of Entomology, Fresno, Calif., gave an address on the general subject of entomology, at the monthly meeting of the Students' Agricultural Club of the Fresno State College.

Mr. Walter Carter, Twin Falls, Idaho, visited points in Oregon and California about the middle of March, conferred with Experiment Station officials and others regarding the sugar-beet leafhopper, and made preliminary plans for undertaking work in Oregon on this pest.

On February 10, Mr. E. A. McGregor appeared before a meeting of merchants and orange growers of Lindsay, Calif., and vicinity, and addressed them on the subject of the citrus thrips. The meeting was well attended and many questions were asked at its conclusion.

Notes on Medical Entomology

The Fourteenth Annual Meeting of the New Jersey Mosquito Extermination Association was held at Atlantic City, N. J., February 23–25, with about 150 delegates present.

According to *Science*, Dr. Francis M. Root, Associate in Medical Entomology at the School of Hygiene of the Johns Hopkins University, sailed on April 27 for Venezuela, where he will study the mosquitoes of the region, returning in September.

Mr. Eric Hearle visited Winnipeg on March 29, and delivered a series of public lectures on the life-history and control of mosquitoes. Mr. Hearle's addresses were given considerable newspaper publicity, as an organized campaign against Winnipeg mosquitoes is being planned under the leadership of Dr. H. M. Speechly.

Mr. C. R. Twinn, of the Entomological Branch, delivered an address entitled "Some Remarks on Canadian Mosquitoes and Anti-mosquito Activities," before the Entomologists' Group of the Professional Institute at Ottawa on February 18. The latter part of the address was illustrated by a series of colored lantern slides. Mr. Twinn addressed the members of the Gastronomic Club on the control of Ottawa's mosquitoes, on March 23, and broadcast a radio talk on "Mosquitoes and Their Control in Canada," from station CNRO, Ottawa, on April 11.

The State Legislature of Montana has recently appropriated $60,000 for the erection of a laboratory at Hamilton, for the State Board of Entomology, to be used in further studies of the Rocky Mountain spotted fever. A sum of about $25,000 per year for the next two years has been provided for carrying on the work on this important problem. The work is being conducted under an informal plan of cooperation between the United States Public Health Service and the Montana State Board of Entomology, the former being represented by Drs. R. R. Spencer and R. R. Parker, and the latter by Drs. W. F. Cogswell and W. J. Butler, and R. A. Cooley.

Apicultural Notes

Mr. James I. Hambleton gave a radio talk over Station WRC on April 27, on "The Honeybee," under the auspices of the Smithsonian Institute.

Recent visitors at the Bee Culture Laboratory included Prof. Francis Jager of the University of Minnesota, and C. L. Sams, Specialist in Beekeeping, of the North Carolina State College of Agriculture and Engineering.

On March 22, Dr. A. P. Sturtevant, in charge of the Intermountain Bee Culture Field Station, gave a radio talk in connection with the program broadcast by the American Honey Producers' League from Laramie, Wyo.

Mr. W. Herrod-Hempsall, Technical Adviser in Beekeeping, Ministry of Agriculture, of the British Government, has arrived in this country with his wife and son. He expects to visit the principal beekeeping centers in the United States and Canada.

Prof. L. F. Bertholf, of Western Maryland College, visited the Bee Culture Laboratory of the Bureau of Entomology on May 2 for the purpose of discussing plans preparatory to continuing during the summer his investigations on the light responses of the honeybee.

Miss Catherine Lucas, who has been studying the amoebae of insects at Johns Hopkins University under a postgraduate traveling fellowship from the University of London, is continuing this line of investigation at the Bee Culture Laboratory of the Bureau of Entomology.

Dr. L. R. Watson of Alfred, New York, formerly connected with the Bee Culture Laboratory of the Bureau of Entomology, gave a demonstration of his method of artificially inseminating queen bees at the Bee Culture Laboratory on April 30, before the members of the Maryland Beekeepers' Association, members of the Department of Entomology of the University of Maryland, and the members of the Bee Culture Laboratory.

Members of the Pan-American Conference on Standardization, meeting this week in the Third Pan-American Commercial Conference, visited on May 10 the exhibit and demonstration of the United States Standard Grades for honey prepared by the Division of Bee Culture Investigations of the Bureau of Entomology. This work was shown in connection with the exhibit of the Bureau of Agricultural Economics in the new Standardization Building. Considerable interest was manifested in this exhibit as a means of facilitating export and import trade in honey, and as a basis for international standardization as the Standard Honey Graders used in this work are now located in Berlin and London, as well as in the export ports of the United States and are also in use in New Zealand.